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A PHONOLOGY OF AKAN: AKUAPEM, ASANTE, FANTE.

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In this preliminary report the authors compare a part of the phonological systems of Akuapem, Asante, and Fante--the major dialects of Akan. The comparison reveals the features common to all three dialects as well as the features which distinguish the dialects from one another. The description of the phonological systems of these dialects is presented within the framework of generative phonology as developed principally by Chomsky, Halle, and Stanley. Although this study does not attempt to present either a complete grammar or a complete phonology of Akan, a "reasonably complete" treatment of the finite verb is given and deep structures and transformational rules are discussed in relation to certain P-rules. Chapter 1 presents the inventory of systematic phonemes and includes the set of Morpheme Segment Structure Conditions which are to be applied to the dictionary matrices of morphemes. Chapter 2 presents the set of Morpheme Sequence Structure Conditions which apply generally to all formatives. The first chapters thus present all the general lexical redundancies in the language and cover a major part of the phonological constraints. Chapter 3 discusses all the general Phonological Rules which apply to the surface structures of sentences. P-rules applying specifically to the finite verb are discussed in Chapter 4, which also discusses various other aspects of Akan surface structures dominated by the Verb-Phrase node. (JD)

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**PAUL SCHACHTER
& VICTORIA FROMKIN**

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PAUL SCHACHTER
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O.E. Contract 6-14-028

The research reported herein was performed pursuant to a contract with the Office of Education, U.S. Department of Health, Education, and Welfare. Contractors undertaking such projects under Government sponsorship are encouraged to express freely their professional judgment in the conduct of the project. Points of view or opinions stated do not, therefore, necessarily represent official Office of Education position or policy.

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Preface

This is a preliminary report on research that we have conducted over the past few years, under U.S. Office of Education Contract OE-6-14-028, into the phonology of the major Akan dialects of Ghana: Akuapem, Asante, and Fante. No one realizes better than we just how "preliminary" a report this is, but we hope that, by issuing it in its present form, we can elicit comments from interested scholars that will assist us in preparing a contemplated revision of the report. We recognize, in particular, that our first-hand investigation of the Fante dialect has been far from thorough, and expect that more errors will be found in our analysis of this dialect than in our analyses of the other dialects with which we have been concerned.

It is a pleasure to acknowledge the assistance that we have had from native speakers of Akan. For Akuapem, our principal informants have been: Miss Doris Anakwa and Miss Mercy Martinson; for Asante, they have been: Miss Agnes Aidoo, Miss Grace Asafogyei, and Miss Grace Meenu Mensah; and for Fante, they have been: Miss Christine Aidoo, Mr. O. K. Brew, Miss Jane Garbrah-Aidoo, and Mr. Albert Kodwo-Mensah. We wish to offer Miss Agnes Aidoo our particular thanks for the many contributions her intelligence and insight into the workings of her native language have made to our work.

We have had the good fortune to have the services of Dr. John M. Stewart of the Institute of African Studies, University of Ghana, Legon as a consultant throughout the course of our research. The influence of Dr. Stewart's investigations of Akan is apparent throughout this report, although he is, of course, in no way responsible for our errors of commission or omission.

Finally, we should like to thank Mrs. Renee Willen and Mrs. Theodora Graham for their assistance in typing, respectively, the preliminary manuscript of the report and the finished version.

P.S.
V.F.

Table of Contents

Introduction

0.10	The Akan Language	3
0.20	The Model	4
0.30	The Phonological Features	6
0.31	Segmental Features	6
0.32	Non-Segmental Features	9
0.40	The Morpheme Structure Conditions	10
0.41	If-Then Conditions	11
0.42	Positive Conditions	12
0.43	Further Remarks on Redundancy	13
0.50	The Phonological Rules	14
0.51	Extension of MS Conditions to P-Rule Output	18
0.60	Syntactic and Diacritic Features	19
0.70	The Treatment of Dialect Differences	19
0.80	The Organization of the Text	20
0.90	Symbols Defined	21

Chapter 1 Segment Structure

1.10	Contrasting Segments	25
1.20	Segment Structure Conditions	28
1.21	Segment Structure Conditions for Vowels	29
1.22	Segment Structure Conditions for Glides	33
1.23	Segment Structure Conditions for Consonants	35
1.24	Segment Structure Conditions for Non-Distinctive Features	38
1.30	Minimally Specified Contrasting Segments	40
1.40	Boundary Units	40
1.50	The Exclusion of Traditional Phonemic Features	44

Chapter 2 Sequence Structure

2.10	Sequential Constraints on Segments	45
2.20	The Structure of the Syllable	46
2.21	The Structure of the Principal Syllable	49

2.30	The Structure of Root Morphemes.	53
2.31	Vowel Tenseness Harmony.	55
2.32	Other Restrictions on Vowels	58
2.33	Dialectal Restrictions	60
2.34	Restrictions on Particular Lexical Categories	61
2.40	The Structure of Derivational Morphemes. .	61
2.50	The Structure of Grammatical Morphemes . .	62
2.51	Verbal Grammatical Morphemes	65
2.52	Nominal Grammatical Morphemes.	65

Chapter 3 General Phonological Rules

3.10	Introduction	69
3.20	Nasalization	71
3.21	Regressive Non-Vowel Nasalization. .	72
3.22	Syllable-Final Nasal Consonants. . .	73
3.23	Nasal Prefixes	75
3.24	Homorganic Nasals.	76
3.25	Progressive Non-Vowel Nasalization .	77
3.26	Vowel Nasalization	78
3.30	Final Consonants	81
3.31	Final [w] → [ʔ].	83
3.32	Glottal-Stop Deletion.	83
3.40	Medial Intervocalic Consonants	84
3.50	Labialization.	87
3.60	Palatalization	89
3.61	Palato-Labialized Non-Vowels and Fronted Round Vowels	91
3.70	Vowel Rules.	96
3.71	Vowel Tensing.	96
3.72	Vowel Backing.	101
3.73	Fante Backness Harmony	102
3.74	Vowel Deletion and Addition.	104
3.80	Systematic-Phonetic Segments	104
3.90	Tone Rules	105
3.91	Downdrift.	106
3.92	The "Drop" or "Mid" Tone	109
3.93	Tone Incorporation and Tone Simplification	111
3.94	Other Tone Rules	115

Chapter 4 The Finite Verb

4.10	Surface Structure of the Finite Verb . . .	117
4.20	The Subject-Concord Prefix	118

4.30	ASPECT	122
4.31	STATive and HABitual	123
4.32	PROgressive	124
4.33	PAST and PERFect	126
4.34	FUTURE	132
4.35	OPTative and IMPerative	134
4.36	CONsecutive	137
4.40	NEGative	141
4.41	Aspectual Changes in Negative Verbs.	146
4.50	INGressive	150
4.60	REDuplication.	155
4.61	General Rule of Monosyllabic RED	156
4.62	Subsidiary Rules Affecting Monosyllabic RED.	162
4.63	General Rule of Disyllabic RED	169
4.64	Subsidiary Rules Affecting Disyllabic RED.	171
4.70	Verb Roots	177
4.71	Tone Raising in Monosyllabic VRs	178
4.72	Replacement of Final Non-Vowel in Monosyllabic VRs by Glottal Stop	181
4.73	Vowel Addition in Monosyllabic VRs	184
4.74	Other Rules Affecting Monosyllabic VRs	185
4.75	Structure of Disyllabic VRs.	189
4.76	Tone Reversal in Disyllabic VRs.	195
4.77	Other Rules Affecting Disyllabic VRs	197
4.78	Trisyllabic VRs.	203
4.79	Final Glottal Stop in VRs.	203
4.80	SUBordinative.	207
4.81	Rules Affecting VP-Final SUB	209
4.90	Tone-Changing P-Rules.	215
4.91	Tone Changes in Affirmative Simple Vs.	216
4.92	Tone Changes in Negative Simple Vs	225
4.93	Tone Changes in Ingressive Vs.	231
4.94	Tone Changes in Reduplicated Vs.	233
4.95	Tone Changes in Verb-Plus-Pronoun Constructions.	236
4.96	Tone Changes in Subordinative Vs	239
	Appendix Phonological Rules	245
	Bibliography	267

Introduction

0.10 The Akan Language.

The most widely spoken language of Ghana consists of a number of more or less mutually intelligible dialects. Until very recently, when Akan became the official name for the dialects spoken by all the Akan peoples, there was no generally accepted name for the language as a whole. Christaller in 1875 used the name Tshi (Twi), a name which has been widely used for two of the dialects dealt with in this study, Akuapem Twi (hereafter, Akuapem) and Asante Twi (hereafter, Asante). The third dialect dealt with is Fante. Asante and Fante are the most widely spoken Akan dialects. Akuapem is included in this study because of its historical role as the dialect originally selected in 1838 as the written literary standard.

Since 1673, when a book by W. J. Muller was published containing about 500 words of the Fante dialect, these three dialects of Akan have been the subject of serious linguistic investigation. The most complete grammar and dictionary of any Akan dialect are those published by Christaller in 1875 and 1881 respectively. These are based primarily on the Akuapem dialect. Various other studies (cf. bibliography) have contributed greatly to an understanding of the grammatical and phonological structure of one or another of the dialects. It is only very recently, however, that much comparative study of these dialects has been attempted. (As J. M. Stewart pointed out in a paper presented to the Seventh West African Languages Congress, comparative study of the Akan dialects has been stimulated by "the current interest in the problem of unifying Akan orthography.")

The present work is an attempt to compare a part of the phonological systems of Akuapem, Asante, and Fante. Such a comparison must reveal the features common to all three dialects as well as the features which distinguish the dialects from one another. No attempt has been made to reconstruct the common historical antecedents which underlie the different synchronic reflexes. It is possible however, that this study of the present-day phonological

systems of the three dialects may shed some light on the phonological changes which have occurred through time.

0.20 The Model.

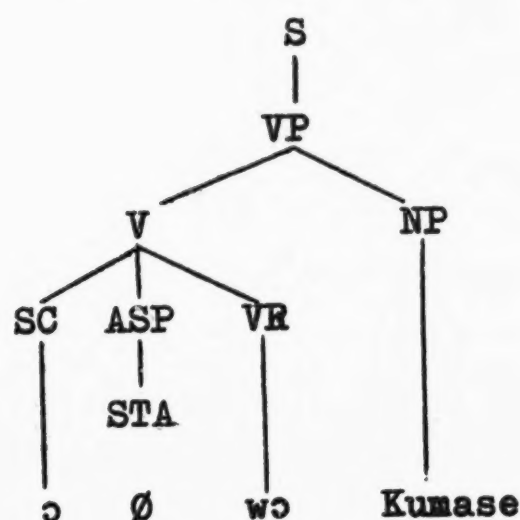
The description of the phonological systems of Asante, Akuapem, and Fante will be presented within the framework of generative phonology as developed principally by Chomsky, Halle, and Stanley (cf. bibliography). This model presupposes a complete transformational-generative grammar, of which the phonological component is a dependent part. The entire grammar consists of a syntactic component, a phonological component, and a semantic component. According to one formulation of the theory of transformational grammar, the syntactic component can be further divided into a set of "base rules", a lexicon or dictionary, and a set of "transformational rules". The output of the base rules specifies the "deep structures" of sentences: i.e., all the syntactic features, constituent relations, etc. which are relevant for the semantic interpretation of the sentence. (This interpretation is provided by the semantic component.) The lexicon includes all the morphemes in the language. Each morpheme is represented by a phonological matrix consisting of columns of segments and rows of distinctive features (cf. Sections 1.30, ff.). (In a full grammar, each morpheme is also represented by matrices of syntactic and semantic features.)

The transformational rules operate on deep structures to produce the "surface structures" of sentences. The surface structures of sentences may be represented as a sequence of morphemes with a labeled immediate-constituent structure, e.g.

$$(1) \quad S[_{VP}[_{V}[_{SC}[_{ASP}[_{STA}[\emptyset]]]_{VR}[w\phi]]]_{NP}[Kumase]]]$$

where the notation $_A[X]$ indicates that the bracketed string X is a string of the category A . This can be represented equivalently as a tree diagram:

(2)



((1) and (2) above represent the surface structure of the sentence Jwo Kumase 'He's in Kumase'.)

The phonological component of the grammar operates on the surface structures of sentences to convert an abstract representation of an utterance, such as (1), into a representation of the phonetic form of the utterance. Thus, the surface structure representations of sentences must include all the syntactic features that are relevant to the way sentences are pronounced.

In our description, we shall be concerned with characterizing a number of interrelated aspects of Akan phonology, among them: (a) phonological redundancies; (b) the structure of morphemes and morpheme classes; (c) the relation between the representations of morphemes in surface structures (the "systematic phonemic" representation) and in phonetic transcriptions (the "systematic phonetic" representation). The characterization of (a) and (b) will be in the form of a set of conditions which we, following Stanley, shall call Morpheme Structure Conditions (MS Conditions); the characterization of (c) will be in the form of a set of rules called Phonological Rules (P-rules).

The model which we are using will be presented in greater detail below. While it is based primarily on the models of Chomsky, Halle, and Stanley, we have altered these models where we have found it convenient to do so. We make no claims about any theoretical validity for the changes we have introduced.

0.30 The Phonological Features.

The contrasting phonological segments of the language will be specified by a set of articulatory distinctive features. We are assuming a universal set of phonetic features such as that proposed by Jakobson and Halle (1956). In making this assumption, we are not necessarily claiming adequacy for the particular set of universal phonetic features we use, which is essentially that of Chomsky and Halle (1968); that is, we are not claiming that a different set of features may not be equally adequate, or perhaps more adequate. (We have, without special comment, changed the definitions of certain features that we have taken from Chomsky and Halle, and have added other features, where we believe that these alterations make for a better characterization of the phonological processes with which we are concerned.) We shall follow the suggestion that on the most abstract level--the systematic-phonemic level--these features are classificatory in nature, and that each feature is defined by two values, '+' and '-'.

The following features will be used. Those marked by an asterisk are the distinctive features which will be necessary to specify the dictionary matrices of morphemes. Where the definition of a feature mentions only the '+' value, the negative value of the feature is defined as absence of the quality stated.

0.31 Segmental Features.

Distinctive Segmental Features

- *1. $\pm$ Vocalic: [+Vocalic] segments include vowels and liquids; [-Vocalic] segments include true consonants and glides.
- *2. $\pm$ Consonantal: [+Consonantal] segments include true consonants and liquids; [-Consonantal] segments include vowels and glides.
- *3. $\pm$ Coronal [+Coronal] segments are those produced with the blade of the tongue raised from its 'neutral' position. Dentals, alveolars, and palatal consonants are [+Coronal], as are front non-low

vowels, and the glide /j/; non-coronal segments include the labial and velar consonants, the glides /w/ and /h/, and the back and low vowels.

- *4. ±Back: [+Back] segments are produced with the back of the tongue retracted. In Akan only the velar consonants, the glides /h/ and /w/, and the back vowels are [+Back]; all other consonants and glides and the front vowels are [-Back].

- *5. ±High: Segments in which the body of the tongue is raised above the 'neutral' position are classified as [+High]. These include the velar, palatal, and palatalized consonants, the glides /j/ and /w/, and the high vowels; [-High] segments include alveolar, dental, and labial consonants, the glide /h/, and the mid or low vowels.

- *6. ±Low: [+Low] segments in Akan include the glides /h/ and [ʔ], and the low vowels. These are produced by lowering the body of tongue below the 'neutral' position.

- *7. ±Continuant: [+Continuant] segments are those in which the air stream passes through the oral cavity without being completely stopped. Continuants are the vowels, glides, liquids, and fricative consonants; noncontinuants include stops, nasal consonants, and affricates.

- *8. ±Voiced: [+Voiced] segments are produced with vibrating vocal cords and include the vowels, the glides /w/ and /j/, the liquids, and the voiced consonants; [-Voiced] (voiceless) segments include the glides /h/ and [ʔ], and the voiceless consonants.

- *9. $\pm$ Tense: [+Tense] segments are produced with greater force and muscular tension, and in Akan are those vowels which are produced with an advanced tongue position (Stewart, 1967); [-Tense] vowels are those not produced with this advanced tongue position. In Akan this feature is restricted to vowels.
- *10. $\pm$ Nasal: [+Nasal] segments are produced with a lowered velum and include nasal consonants and nasalized vowels; [-Nasal] (oral) segments are produced with a raised velum.
- *11. $\pm$ Tone: [+Tone] segments are those with contrastive high tone; [-Tone] segments are those with contrastive low tone. In the phonological matrices, tone is distinctive only for [+Vocalic] segments (vowels). (Phonological Rules will spread tone to other segments, and will further specify scalar tonal values: e.g., the 'mid' or 'drop' tone will be differentiated on the systematic phonetic level.)

Redundant Segmental Features

12. $\pm$ Sonorant: [+Sonorant] segments include vowels, the glides /w/ and /j/, the liquids /r/ and /l/, and the nasal consonants; [-Sonorant] segments (obstruents) include non-nasal consonants and the glide /h/.
13. $\pm$ Anterior: [+Anterior] segments include labial, dental, and alveolar consonants and the glide [w] (which are produced in front of the palato-alveolar region); [-Anterior] segments include velar and palatal consonants, the vowels, and the glides [j] and [h].
14. $\pm$ Round: [+Round] segments are produced with lip rounding and include labialized consonants and rounded vowels.

15. $\pm$ Palatal: [+Palatal] segments are produced with the front of the tongue raised toward the hard palate; [-Back, -Low] vowels, palatalized non-vowels, and the glide /j/ are [+Palatal]; all other segments are [-Palatal].
16. $\pm$ Strident: [+Strident] segments are [-Sonorant] continuants and affricates; [-Strident] segments are plosives and sonorants. (Stridency is a feature restricted to non-vowels.)
17. $\pm$ Delayed Release: This feature is restricted to sounds produced with complete closure, and distinguishes affricates from plosives, with the former being segments marked by a slow rather than an abrupt release, producing friction after the release of the stop closure.
18. $\pm$ Glottal Constriction: In Akan only the phonetic glottal stop is marked by the feature [+Glottal Constriction].

0.32 Non-Segmental Features

- *19. $\pm$ Segment: This feature distinguishes systematic phonemic segments which are marked [+Segment], from boundary units which are marked [-Segment].
- [-Segments] are further divided into the following boundaries:
20. $\pm$ Syllable Boundary (SB): Symbolized as '='
21. $\pm$ Formative Boundary (FB): Symbolized as '+'
(formative and morpheme are near-equivalents)
22. $\pm$ Word Boundary (WB): Symbolized as '#'
23. $\pm$ Phrase Boundary (PB): Symbolized by a comma ','
24. $\pm$ Sentence Boundary (SnB): Symbolized by a period '.'

The Boundaries ([-Segments]) 20 through 24 are hierarchal. That is, a [+SnB] implies the presence of all other boundary features; a [+PB] implies the presence of [+WB], [+FB], [+SB]; a [+WB] implies [+FB], [+SB]; and a [+FB] implies [+SB].

0.40 The Morpheme Structure Conditions.

Like all languages, the Akan dialects reveal a high degree of phonological redundancy. In the model we are using, this redundancy is characterized by a set of Morpheme Structure (MS) Conditions. We shall be concerned with three types of redundancy: (a) constraints on the combinations of phonological features which occur in individual segments (which are stated by a subset of MS Conditions called Segment Structure Conditions); (b) constraints on the sequences of segments or features which can occur within one morpheme (which are stated by a subset of MS Conditions called Sequence Structure Conditions); (c) constraints on combinations of (a) and (b) as they relate to different morpheme classes. The following are examples of these three types:

(a) Voicing is a redundant feature for Akan fricatives. Thus sa and fa are possible, whereas *za and *va are not. In terms of the features listed above we can state that all

$\left[\begin{array}{l} +\text{Consonantal} \\ -\text{Vocalic} \\ +\text{Continuant} \end{array} \right]$	segments are [<u>-Voiced</u>]
--	---------------------------------

(When features occur in vertical order enclosed in square brackets, this is to be interpreted as a set of simultaneous features occurring in one segment. When features occur in horizontal order, this is to be interpreted as features belonging to sequential segments.)

(b) The feature [Vocalic] is redundant for primary syllable-initial segments, and for the second segment in a primary syllable. The initial segments are all [-Vocalic] (glides or true consonants) and the second segments of these syllables are all [+Vocalic] (vowels).

(c) Verb roots are either monosyllabic or disyllabic, i.e. are of one of the two following shapes: [= X =], or [= X = X =] where X contains no [+SB]. (For exceptions, cf. Section 4.78.)

In dealing with redundancies of these kinds by means of MS Conditions, we follow Stanley, who states: "For every significant generalization that can be made about the morphemes of the language there is a corresponding MS Condition." We also follow Stanley in making a formal distinction between MS Conditions of two types: "If-Then Conditions" (I-TC) and "Positive Conditions" (PC). (We have not found a need for Stanley's third type of MS Condition, "Negative Conditions".)

0.41 If-Then Conditions.

An I-T Condition requires two parts, which are somewhat similar to the two parts of a transformational rule in the syntactic component. One must state the structural description of the dictionary matrix to which the condition applies (the 'If') and the structural change which takes place (the 'Then').

The fact that there are no voiced fricatives in Akan (a Segment Structure constraint) can be stated as an I-T Condition:

I:	[+Consonantal] [+Continuant]
	↓
T:	[-Voiced]

The above condition is to be interpreted as follows: If a segment is both [+Consonantal] and [+Continuant], it is also [-Voiced]. Thus, the feature specifying voicing can be left blank in the dictionary matrix of any morpheme which contains as one of its segments [s] or [f]. Since the If part of the condition will match the dictionary matrix, the condition applies and the blank for the feature [Voiced] will be filled in automatically as a minus.

An I-T Condition can also be stated for sequential constraints. One generalization which will be discussed in chapter 4 is that the initial segment of the second

syllable of a disyllabic Verb Root must be a true consonant, (i.e. [-Vocalic, +Consonantal]). This can be stated by the following I-T Condition:

$$\begin{array}{ccc} \text{I:} & \text{VR}[X = [&] X] \\ & \downarrow & \\ \text{T:} & & [+Consonantal] \end{array}$$

Since the MS Conditions are unordered, whenever one is applicable it will be mapped onto any lexical matrix which is a submatrix of the matrix specified in the Condition. Thus a matrix which is marked [+Consonantal] by the above condition will still have unspecified the value for the feature [Vocalic]. By a Segment Structure Condition (of the If-Then type), all [+Consonantal] segments in Akan are also [-Vocalic]. Thus, in the lexical matrix of all disyllabic Verb Roots, the initial segment of the second syllable will have blanks in the cells for the features [Consonantal] and [Vocalic]. These blanks will be filled by the Sequence Structure and Segment Structure Conditions just discussed.

0.42 Positive Conditions.

Stanley states that "each positive condition consists simply of an incompletely specified matrix." For example, we would like to show that all the vowels in any one morpheme are either tense or lax. This may be stated as follows:

$$\text{PC: } + X \begin{bmatrix} +\text{Vocalic} \\ \alpha \text{Tense} \end{bmatrix}^* X +$$

: X does not include a +.

(As was noted in Section 0.32, a plus represents Morpheme Boundary. The asterisk is to be interpreted as a symbol for iteration: i.e., in this case, the condition applies to any number of segments of the specified type within a single morpheme. The alpha is a variable ranging over plus and minus: i.e., for every occurrence of α in a rule, $\alpha = +$, or $\alpha = -$; $-\alpha$ then assumes the opposite value of that assigned to α . In other conditions and rules, additional Greek letters--beta (β), gamma (γ), etc.--are similarly used.)

Stating this positive condition permits us to mark only one vowel in a dictionary matrix for the feature [Tense]. It does not matter which vowel is marked. Since tenseness is a property of the entire morpheme we do not want to state this fact in an I-T Condition which would have to stipulate the particular segment, but rather show by a positive condition that the feature applies to all vowels. We will mark the first vowel for this feature in the dictionary matrices, but it should be understood that this is an arbitrary decision, and that we could just as easily have chosen to mark the last vowel instead. It is the condition itself which makes the generalization and not the dictionary matrices, and therefore we need not be concerned about which segment is marked.

0.43 Further Remarks on Redundancy.

The cells of the phonological matrices in the lexicon can be specified as either '+' or '-' or can be left blank. A blank is not to be considered a third value. Specifically, a blank in any cell in the dictionary matrix of a morpheme represents a redundant specification: i.e., a + or - which is predictable from the MS Conditions. The dictionary matrices will therefore represent non-redundant specifications of the segments which comprise them. According to the Stanley model, once all the matrices have been matched with the MS Conditions, all features will be specified by one of the binary values. That is, no blanks will remain. We shall depart from the model in this respect, since we believe that the features of certain segments cannot be specified in any non-arbitrary fashion. For example, the negative morpheme in Akan is a low-tone nasal prefix -N-. Phonetically it is realized as a nasal consonant homorganic with the consonant that follows it. One could arbitrarily assign any point of articulation, e.g. [+Coronal] (/n/), and then by a later P-Rule adjust the features to agree with the articulatory features of the following consonant. We believe that this would fail to capture a generality which is present: i.e., that the negative prefix is unmarked for point of articulation. If it were the case that in a phonetic meta-theory the alveolar nasal was designated as the "unmarked" nasal in all languages, it might be reasonable to mark all such neutralized features with the unmarked values. Since to date the markedness of features has not been established in any general phonetic theory, we shall

leave such features unmarked not only in the lexicon but also in surface structure representations of sentences. (In other words, such neutralized features acquire a specification only as a result of the application of P-Rules.)

In summary, then, we can see that given a sample of the lexicon which is inclusive enough to illustrate all the major segments and constraints of the language, and given the set of MS Conditions, all the significant generalizations about phonological redundancies will be revealed. That is, the set of MS Conditions (Segment Structure and Sequence Structure) should permit the most economical representation of the dictionary matrices: i.e., matrices in which occur the largest number of blanks.

Furthermore, the Sequence Structure Conditions formalize what Firth called the polysystemic nature of language: the fact that only certain contrasts are found in specific places within the morpheme. For example, the Sequence Structure Conditions on Akan root morphemes provide a formal account of the fact that vowels are never in contrast with non-vowels, of the fact that the possible contrasts of syllable-final consonants are much more limited than those of syllable-initial consonants, etc.

0.50 The Phonological Rules.

The input to the set of phonological (P) Rules will be the surface structures of the sentences generated by the syntactic component. These will be labeled and bracketed strings of morphemes (cf. Section 0.20), with the morphemes represented by systematic-phonemic matrices. The P-rules will map each such string onto a representation of the sentence at the systematic-phonetic level. The P-rules may change feature values (a '+' to a '-', or vice versa), may add or delete whole segments, may permute segments, may introduce new features by adding new rows, etc. The P-rules may also substitute integers (representing relative scalar values) for a '+' or '-'. For example, the underlying forms of morphemes (dictionary matrices) can be specified by marking tone bearing units as contrasting in a binary fashion, either high [+Tone] or low [-Tone]. It is an important phonetic fact, however, that a "downdrift" occurs, such that, whenever a low tone

intervenes between two high tones, the second high tone is lower than the first, and whenever a high tone intervenes between two low tones, the second low tone is lower than the first. This phenomenon will be revealed by the P-rules, so that the final phonetic output will be marked for relative tone as well as contrastive tone. Furthermore, there are certain phonological phenomena which do not apply to a single morpheme, but which do apply across morpheme boundaries. All such phenomena will be specified by P-rules.

The P-rules will be linearly ordered. They will also be cyclical. A cycle consists of a sequence of ordered rules which are applied in the following fashion: first the rules are applied to the innermost immediate constituents of the utterance. Once the rules have applied, the brackets are erased. Then the rules are applied to the next innermost IC's etc., until no more brackets remain. For example, given the utterance cited above Owo Kumase 'He's in Kumase' with the structure:

$$S[VP[V[SC[\textcircled{\text{v}}]ASP[STA[\emptyset]]VR[w\textcircled{\text{v}}]]NP[Kumase]]]$$

the rules first apply to $STA[\emptyset]$, and then, on a second cycle, to $SC[\textcircled{\text{v}}]$, $ASP[\emptyset]$, and $VR[w\textcircled{\text{v}}]$. When the brackets are erased, the third cycle of the rules applies to $V[\textcircled{\text{v}}w\textcircled{\text{v}}]$ and $NP[Kumase]$. Again the brackets are erased, and the fourth cycle applies to $VP[\textcircled{\text{v}}w\textcircled{\text{v}} Kumase]$. Finally, a fifth cycle of the rules applies to $S[\textcircled{\text{v}}w\textcircled{\text{v}} Kumase]$.

The P-rules will have the following general form: $A \rightarrow B/X \text{---} Y$. The arrow ($\rightarrow$) means 'rewrite as' or 'replace by'. The slash (/) means 'in the environment of'. Thus, the rule above is to be interpreted as: "Replace A by B when A is preceded by X and followed by Y." Furthermore, this rule is to be interpreted in such a way that all non-redundant features of A which are not specifically mentioned in the rule remain unchanged. (For the effect of P-rules on redundant features, cf. Section 0.51.) For example, a P-rule such as:

$$\left[\begin{array}{c} -\text{Low} \\ \text{V} \end{array} \right] \rightarrow [\alpha \text{Back}] / \text{---} (C) \left[\begin{array}{c} \alpha \text{Back} \\ \text{V} \end{array} \right]$$

(where $V = \begin{bmatrix} +\text{Vocalic} \\ -\text{Consonantal} \end{bmatrix}$, () = optionally present, and $C = \begin{bmatrix} -\text{Vocalic} \\ +\text{Consonantal} \end{bmatrix}$)

is to be interpreted as follows: rewrite all [-Low] (high or mid) vowels as [-Back] (front) vowels before an optional consonant followed by a [-Back] vowel, and rewrite all [-Low] vowels as [+Back] vowels before an optional consonant followed by a [+Back] vowel. Non-redundant features of the vowels remain unchanged: e.g., high vowels remain high, mid vowels remain mid, nasalized vowels remain nasalized, etc.

It should be noted that in P-rules of the form given above A and B are units which represent whole segments, or specific features of segments. Since P-rules can add segments or delete segments, and add and delete features, A and B may be null. Thus we may have a rule where B is null ($B = \emptyset$):

$$V \rightarrow \emptyset / \underline{\quad} V$$

Or we may have a rule where A is null. Such a rule is needed for underlying monosyllabic verb stems with the structure CVC which have as surface structures the phonetic form CVCV. This can be stated by a rule of the general form:

$$\emptyset \rightarrow v/v_R [CVC] \_$$

(The specific rule will of course state the features of the vowel to be added.)

The context or environment represented by X and Y in the formula given above may represent labeled category brackets, features, or segments, or may also be null. This is necessary since some rules will pertain only to certain IC classes, other rules will refer to phonetic contexts, and other rules will have no contextual restrictions.

It is obvious from the above that there is no one-to-one correspondence between the systematic-phonemic matrices and the systematic-phonetic matrices. In some cases segments which have identical specifications in the systematic-phonemic matrices will have distinct systematic-phonetic

matrices. In other cases, the reverse will be true. We believe that such a position has been fully justified in previous publications.

The necessity for linearly ordered rules can be illustrated in Akan by the following example.

A /u/ which occurs as the first vowel of a diphthong in a lexical matrix is always deleted. This deletion, however, must occur after the /u/ has labialized the preceding non-vowel. For example, the underlying representation of the word hwe [çuɛ] 'look at' is /huɛ/. By the labialization rule the /h/ becomes labialized before /u/. The /u/ is then deleted, and the consonant becomes palatalized before /ɛ/. The following derivation shows the ordering which takes place.

/huɛ/	Underlying form
[hwuɛ]	Labialization rule
[hwɛ]	[U]-Deletion rule
[çuɛ]	Palatalization rule

If the [U]-deletion rule occurred prior to the labialization rule, the context for labialization would not be present and no labialization could occur.

As will be shown in the sections below, the ordering of P-rules is necessary in many other cases.

After all the P-rules have been applied any remaining boundary elements are removed. The final output will then be the sentence in phonetic transcription.

Our view of the phonetic transcription follows that of Chomsky and Halle (1968):

(The phonetic transcription is not) a record of what is overtly present in the signal, but rather...a representation of what the speaker of a language knows about the phonetic properties of an utterance by virtue of his knowledge of the surface structure of the sentence and of the rules of the phonological component.

It is suggested by Chomsky and Halle that in the final systematic-phonetic matrices which represent a sentence all + and - feature values should be given final scalar values. In our description such values will be used only for tone. For example, we will not specify by an integral value the duration of voicing or the degree of nasalization.

0.51 Extension of MS Conditions to P-Rule Output.

As was noted in Sections 0.41 and 0.42, the MS Conditions are applied to (mapped onto) all matrices in the surface structure representations of sentences prior to the application of the P-rules. We shall find, however, that some of the MS conditions apply to strings which are the output of P-rules, as well as to those which are the input to this component of the grammar. To repeat these conditions as P-rules, or to specify the redundant features in P-rules, would not only be uneconomical but would obscure the generality concerning the redundancies which persist. We therefore include the convention that when a feature is specified as redundant in the MS rules, it remains redundant with the application of the P-rules, if the non-redundant feature is changed and the redundant feature is not mentioned. For example, at the systematic-phonemic level all [-Back] vowels in Akan are redundantly [-Round], and are so specified in the MS Segment Structure Conditions. If a P-rule changes the feature specification of a vowel from [+Back] to [-Back] and does not mention the feature [Round], this implies that the segment which was redundantly [+Round] becomes [-Round] simultaneously with the change of the backness feature. However, if a feature which is redundant in the underlying lexical matrix is specifically mentioned in a P-rule, the MS conditions will not reapply. Thus, a P-rule designed to change the [+High, +Back, +Round] vowel [u] to its [-Back] counterpart [ü] (a segment type that does not occur as a systematic phoneme in Akan, but that does occur at the systematic-phonetic level) must explicitly mention the retained specification of the feature [Round]: i.e.,

$$\begin{bmatrix} +\text{High} \\ +\text{Back} \\ +\text{Round} \\ \dots \end{bmatrix} \rightarrow \begin{bmatrix} -\text{Back} \\ +\text{Round} \end{bmatrix} / \text{X}$$

0.60 Syntactic and Diacritic Features.

In addition to the phonological features discussed in Sections 0.30 through 0.32, phonological matrices may include features of two other types: syntactic features and diacritic features.

Syntactic and diacritic features are properties of the entire formative. If a formative belongs to the syntactic category Verb Root (VR), this then becomes a syntactic feature of each segment of the formative, and by convention each segment is marked [+VR] (cf. Chomsky and Halle, 1968, pp. 174-176). We shall find that this is a necessary convention in applying the MS Conditions and the P-rules. On the other hand, we shall also find that there are some formatives which are exceptions to the general conditions and rules. These will constitute a very small subset of the entire lexicon, and we would fail to reveal the major generalities about the phonology of Akan if we did not in some way exclude these exceptions. For example, in disyllabic Verb Roots we shall see that there are certain constraints on the vowels which can occur. If the vowel of the second syllable is a high back vowel, /U/, the vowel of the first syllable must also be /U/. We have found one exception to this condition: the Verb Root kamfo /kábfùk/ 'praise'. Each segment of this VR will therefore be marked [-Sq SC n] (minus Sequence Structure Condition n), where n is the number of the Condition which does not apply. This is a diacritic feature, and a property of the entire morpheme. Where formatives are regular, i.e. not exceptions, by convention each segment will automatically be considered as marked [+MSC n] or [+P m], where n and m stand for the numbers of the MS Conditions and P-rules.

0.70 The Treatment of Dialect Differences.

The theory of generative grammar of which generative phonology is one part has primarily been conceived of as a description of the knowledge of an ideal speaker-hearer of one dialect. Our attempt to use this model to describe and compare three distinct dialects therefore creates new problems. The solutions which have been adopted here are, for the most part, ad hoc solutions, but ones which we believe can adequately reveal the similarities and the regularities which are found in the three dialects, and which

at the same time permit the simplest method of differentiating between the different dialects. The base forms (dictionary matrices) of the morphemes are constructed with the aim of formulating a set of MS Conditions and P-rules with the widest range of applicability to all three dialects. Some number of rules will apply to all the dialects, others to two of the three, and still others will be restricted to one dialect. This is unavoidable since a comparative study of Akan reveals some innovations which are common to the dialects and other innovations unique to a single dialect. (Further comparative work might make it possible to postulate a set of base forms which more directly represent reconstructed proto-Akan morphemes.) In the sections to follow, the rules which apply to all dialects will be unmarked; those which have specific dialect application will be marked Ak for Akuapem, As for Asante, and Fa for Fante.

An alternative solution would have been to start with one of the dialects as basic and after deriving the surface and phonetic forms of this dialect, construct a set of transfer rules to derive the other dialects. We rejected this approach since we concluded that such a description would lead to fewer insights regarding both the diachronic and synchronic phonology of Akan.

0.80 The Organization of the Text.

This study does not attempt to present either a complete grammar or a complete phonology of Akan. Our syntactic characterization of sentences will, in general, be limited to those parts of Akan surface structures which are relevant to the phonology of the language. (In certain cases, however, it will be necessary to refer to the deep structures of sentences and the transformational rules which permit the operation of the P-rules. Such syntactic base rules and transformational rules as are necessary will be presented in the relevant sections.) Our phonology is reasonably complete only with respect to the phonology of the finite verb (which is, however, easily the most complex part of the Akan phonological system). Other parts of the phonological system are given less attention, or, in some cases (e.g., the phonology of ideophones), none.

Chapter 1 presents the inventory of systematic phonemes. It also includes the set of Morpheme Segment

Structure Conditions which are to be applied to (mapped onto) the dictionary matrices of morphemes.

Chapter 2 presents the set of Morpheme Sequence Structure Conditions which apply generally to all formatives. (Those applying only to the Verb Root are presented in Chapter 4.) Chapters 1 and 2 between them thus present all the general lexical redundancies in the Akan language, and cover a major part of the phonological constraints of the language.

Chapter 3 discusses all the general Phonological Rules which apply to the surface structures of sentences. P-rules which apply specifically to the finite verb are discussed in Chapter 4. This chapter also discusses various other aspects of Akan surface structures dominated by the node VP (Verb Phrase).

Finally, an Appendix presents the set of all of the ordered P-rules (those discussed in Chapters 3 and 4).

0.90 Symbols Defined.

- | | |
|---|--|
| V | Any 'true' vowel, i.e. a segment which is
<div style="display: inline-block; vertical-align: middle;"> <div style="border-left: 1px solid black; padding-left: 5px; margin: 0 5px;">+Vocalic</div> <div style="border-left: 1px solid black; padding-left: 5px; margin: 0 5px;">-Consonantal</div> </div> |
| C | Any non-vowel, i.e. a segment which is [-Vocalic]
or [+Consonantal]--a true consonant, liquid,
or glide |
| N | Any nasal consonant, i.e. a segment which is
<div style="display: inline-block; vertical-align: middle;"> <div style="border-left: 1px solid black; padding-left: 5px; margin: 0 5px;">+Consonantal</div> <div style="border-left: 1px solid black; padding-left: 5px; margin: 0 5px;">+Nasal</div> </div> , or an archisegment which is
<div style="display: inline-block; vertical-align: middle;"> <div style="border-left: 1px solid black; padding-left: 5px; margin: 0 5px;">+Segment</div> <div style="border-left: 1px solid black; padding-left: 5px; margin: 0 5px;">+Nasal</div> </div> |
| G | A glide, i.e. a segment which is <div style="display: inline-block; vertical-align: middle;"> <div style="border-left: 1px solid black; padding-left: 5px; margin: 0 5px;">-Vocalic</div> <div style="border-left: 1px solid black; padding-left: 5px; margin: 0 5px;">-Consonantal</div> </div> |
| L | A liquid, i.e. a segment which is <div style="display: inline-block; vertical-align: middle;"> <div style="border-left: 1px solid black; padding-left: 5px; margin: 0 5px;">+Vocalic</div> <div style="border-left: 1px solid black; padding-left: 5px; margin: 0 5px;">+Consonantal</div> </div> |

- $\tilde{V}$ A nasalized vowel, i.e. a segment which is
 $\left[\begin{array}{l} +\text{Vocalic} \\ -\text{Consonantal} \\ +\text{Nasal} \end{array} \right]$
- $\emptyset$ Zero, or a null segmental element
- $\acute{x}$ The acute accent represents high tone.
- $\grave{x}$ The grave accent represents low tone.
- $\dot{x}$ The vertical accent represents 'drop' or 'mid' tone.
- A, E, I, O, U Cover symbols for vowel archi-segments, all of which are $[\pm\text{Tense}, \pm\text{Nasal}, \pm\text{Tone}]$
- A Vowel segment which is $[-\text{Back}, +\text{Low}]$
- E Vowel segment which is $[-\text{Back}, -\text{High}, -\text{Low}]$
- I Vowel segment which is $[-\text{Back}, +\text{High}]$
- O Vowel segment which is $[+\text{Back}, -\text{High}, -\text{Low}]$
- U Vowel segment which is $[+\text{Back}, +\text{High}]$
- / / Systematic-phonemic representation; i.e. the dictionary matrix after the blanks have been filled in by the MS Conditions
- [] Systematic-phonetic representations, or any representation between the systematic-phonemic and systematic-phonetic representations: i.e., any representation reflecting the application of any P-rules
 (Note: In the text, where a systematic phonemic or systematic phonetic transcription is used, e.g. /hué/ or [çué], this is to be understood as a shorthand version for the feature matrices.)
- 'Replace by' or 'Rewrite as', e.g. A → B means 'Replace A by B' or 'Rewrite A as B'

/

'In the environment of', e.g. (1) $A \rightarrow B/X\_Y$
 (2) $A \rightarrow B/\_X$, (3) $A \rightarrow B/X\_$.
 Read (1) as 'Replace A by B when A follows X and precedes Y; or $XAY \rightarrow XBY$
 (2) means $AX \rightarrow BX$, or 'Replace A by B when it occurs before X
 (3) means $XA \rightarrow XB$, or 'Replace A by B when it occurs after X.

$$\begin{bmatrix} F_1 \\ F_2 \\ \vdots \\ F_n \end{bmatrix}$$

Feature specification for one segment, e.g.

$[+F_1] \rightarrow [-F_1]/\begin{bmatrix} +F_2 \\ -F_3 \end{bmatrix}$ means 'Replace $+F_1$ by $-F_1$

when F_1 occurs in a segment where F_2 is specified as +, and F_3 is specified as -.'

()

Optional element. e.g. $A \rightarrow B/\_(C)V$ 'Replace A by B when A occurs before CV, or when A occurs before V. The use of parentheses in a rule thus is an abbreviation for two rules. The rule given above collapses the two rules: (1) $A \rightarrow B/\_CV$, and (2) $A \rightarrow B/\_V$

When a rule includes an optional element, first apply the rule with the option chosen. Since these are ordered rules, if one is applied, the other cannot apply.

$$\left\{ \right\}$$

Select one of the items within the braces. This is also a schematic notation which collapses rules. e.g.

$$A \rightarrow B/\_ \begin{Bmatrix} C \\ D \end{Bmatrix} \begin{matrix} (1) \\ (2) \end{matrix}$$

represents the following two rules: (1) $A \rightarrow B/\_C$, (2) $A \rightarrow B/\_D$. If the output after applying (1) fits the conditions for application of (2), apply (2).

$\alpha, \beta, \gamma, \dots$ Variables stand for either + or -. e.g.

$$F_1 \rightarrow \alpha F_1/\_ \alpha F_2$$

'If F_2 is +, then F_1 is +, and if F_2 is -, then F_1 is -.'

$$F_1 \rightarrow -aF_1 / \text{---} aF_2$$

'If F_2 is +, then F_1 is -, and if F_2 is -, then F_1 is +.

<>

Angled brackets used in P-rules specify that if one item is chosen, the other must also be chosen, e.g.

$$A \rightarrow \begin{bmatrix} +F_1 \\ -F_2 \\ \langle +F_3 \rangle \end{bmatrix} / \begin{bmatrix} +F_1 \\ -F_2 \\ \langle +F_4 \rangle \end{bmatrix} \text{ ---}$$

This means that if F_4 in the preceding segment is not +, then F_3 will remain unchanged.

When a rule includes angled brackets, first apply the rule with the items in the brackets chosen. If a rule includes both parentheses and angled brackets, expand the parentheses before the angled brackets.

#

Word boundary

+

Morpheme boundary

=

Syllable boundary

,

Pause, phrase boundary

.

Sentence boundary

Chapter 1

Segment Structure

1.10 Contrasting Segments.

Twenty-seven contrasting segments (systematic phonemes) are needed to differentiate all possible morphemes in Akan: eight true consonants (C), /p, b, t, d, k, g, s, f/; three glides (G), /j, w, h/; and sixteen vowels (V), /i, ɪ, ɛ, e, ɛ̃, a, ɔ̃, ɔ̃, u, ʊ, ũ, ʊ̃, o, ɔ/. Ten segmental binary features are needed to specify these segments: [Vocalic], [Consonantal], [Continuant], [Back], [Coronal], [Voiced], [High], [Low], [Nasal], [Tense]. Besides these ten distinctive features, the following four redundant features will be specified by Morpheme Structure Conditions, and will be utilized in the Phonological Rules to define classes of sounds and to produce the systematic-phonetic output: [Sonorant], [Anterior], [Round], and [Palatal]. (The other three redundant segmental features listed in Section 0.32--[Strident], [Glottal Constriction], and [Delayed Release]--are introduced by P-rules.)

Underlying morphemes in Akan are also differentiated by the presence or absence of high tone, which is marked in the lexicon only for vowel segments. Thus each of the above vowel segments will be marked by the feature [+Tone], or [-Tone], with [+Tone] signifying high tone or pitch, and [-Tone] signifying low tone or pitch.

An inventory of the contrasting segmental units, with all features exclusive of tone marked, is given in Table 1.

It should be kept in mind that the segments listed in Table 1 are those needed for the underlying systematic-phonemic matrices of Akan formatives, and that segments of other kinds may occur in the final phonetic matrices which result from the application of the P-rules. Thus, for example, while there are no underlying palatalized or labialized non-vowel segments, such segments do result from applying certain P-rules to surface structures. Similarly, while there are no underlying nasal non-vowels, voiced non-vowels

preceding nasalized vowels will be realized phonetically as nasals as a result of the application of a P-rule. For example, the underlying matrix of the Verb Root ma 'give' may be represented (after certain Morpheme Structure Conditions have applied) as follows:

	b	ã
Segment	+	+
Vocalic	-	+
Consonantal	+	-
Coronal	-	-
Back	-	-
High	-	-
Low	-	+
Continuant	-	+
Voiced	+	+
Tense*		-
Nasal	-	+
Tone*		-

(*The features [Tense] and [Tone] are applicable only to vowels.)

The first column contains a minus in the row representing the feature [Nasal], while the second column of the matrix contains a plus in this row, specifying the nasality of the vowel segment. A P-rule will change the - to a + in the first column, by virtue of the nasality of the following vowel. In other words, nasality of non-vowels is predictable by rule, and thus need not be specified at the systematic-phonemic level. By limiting the underlying segments to only the distinctive features, we reveal phonological generalities about Akan through explicit statements as provided by the P-rules. (In the case of the nasal non-vowels, an alternative solution would have been to treat nasality as a redundant feature of non-vowels preceding nasalized vowels, and to use the MS Conditions rather than the P-rules, to reveal the generality. However, this would have necessitated a larger inventory of systematic phonemes than we believe is necessary.)

It should also be kept in mind that a number of the features which are needed to contrast certain underlying segments are redundant in the case of certain other segments: i.e., they can be predicted from the presence of other features in the segment. Since such features are predictable, blanks may be left in the cells of lexical matrices which correspond to these features, providing we formally state the conditions by which the cells may be filled in. Such conditions are the Segment Structure Conditions. There are also certain features that are never distinctive: i.e., that are never needed to contrast underlying segments. Certain of these features will also be specified by the Segment Structure Conditions. (The remaining non-distinctive features are inserted by P-rules.)

By stating 21 Segment Structure Conditions we are able to leave blanks in 263 of the 378 cells in the matrix of Table 1. Every blank which appears in the lexicon, and which can be filled in by a matching process which matches the lexical matrices to these stated conditions, reveals a generalization about the phonology of Akan.

1.20 Segment Structure Conditions.

All of the Segment Structure Conditions (SgSCs) are If-Then Conditions (cf. Section 0.41). In our presentation of these conditions, we shall first cover conditions that specify some of the ten distinctive features. Conditions specifying such features for vowels will be presented in Section 1.21, those for glides in Section 1.22, and those for true consonants in Section 1.23. Finally, in Section 1.24, we shall present the SgSCs which specify four non-distinctive features.

In our presentation, we shall not always attempt to state SgSCs in their simplest or most elegant form. Instead, our aim will be to state the conditions in such a way as to reveal with maximum clarity the redundancies relevant to each class of sounds. Thus one rule pertaining to vowels states that all vowels are redundantly continuants, and another rule pertaining to glides states that all glides are also redundantly continuants. These two rules could have been combined as follows:

I: [-Consonantal]



T: [+Continuant]

But we have preferred instead to treat the redundancy for vowels and that for glides separately.

1.21 Segment Structure Conditions for Vowels.

There are five vowel archisegments represented in underlying (dictionary) matrices, as follows:

	-Back	+Back
+High -Low	I	U
-High -Low	E	O
-High +Low	A	

Table 2

Each of these archisegments may be divided into tense and lax vowels, and the non-mid vowels may be further divided into oral and nasal vowels. (The mid vowels are all oral vowels.) The complete inventory of phonological vowels (with the exception of tone) is shown in Table 3.

	-Back		+Back		
	+Tense	-Tense	+Tense	-Tense	
+High -Low	ĩ	ɪ̣	ũ	ʊ̣	+Nasal
	i	ɪ	u	ʊ	-Nasal
-High -Low	e	ɛ	o	ɔ	-Nasal
-High +Low	ẽ	ã			+Nasal
	ə	a			-Nasal

Table 3

Some of the features shown in Table 3 are redundant. These redundancies, as well as certain other redundancies involving features not shown in Table 3, are stated in Segment Structure Conditions 1 through 5 below.

SgSC 1: I: [+Vocalic]

↓

T: $\left[\begin{array}{l} -\text{Consonantal} \\ +\text{Voiced} \\ +\text{Continuant} \end{array} \right]$

This condition states that all [+Vocalic] segments are true vowels: i.e., there are no liquids in the underlying forms of Akan morphemes. It states further that there are no voiceless vowels, and that all vowels are continuants.

(It is true that the surface forms of Akan utterances have segments which are phonetically realized as the liquid [r]: e.g., kyere [tɕĩrɛ] 'show', Ak-As horo [hũrũ]/Fa [hũrʔ] 'wash'. Such occurrences of [r] result from the operation of two P-rules: P 15, which replaces a /d/ between oral vowels by [r], and P 03, which replaces a final /t/ by [r]. P 15 is applied in the derivation of

[tɕiré] from underlying /kɪdɛ/, and P 03 is applied in the derivation of Ak-As [huru]/Fa [hur?] from underlying /hɪt/.)

SgSC 2: I: [+Vocalic]
 [+Back]
 ↓
 T: [-Coronal]
 [-Low]

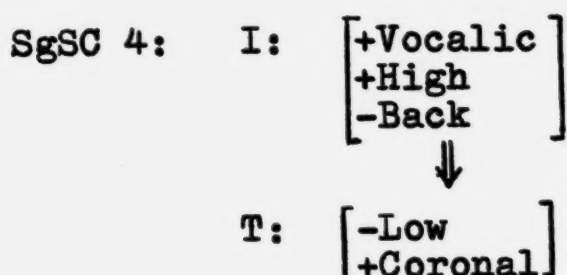
This condition states that all Akan back vowels are non-low vowels, and that back vowels are non-coronal. (Given the definition that [+Coronal] sounds are "produced with the blade of the tongue raised from its neutral position" (Chomsky and Halle, 1968, p. 304), back vowels, which are produced by raising the body of the tongue, rather than the blade, must necessarily be classified as [-Coronal].)

SgSC 3: I: [+Vocalic]
 [+Low]
 ↓
 T: [-Back]
 [-Coronal]
 [-High]

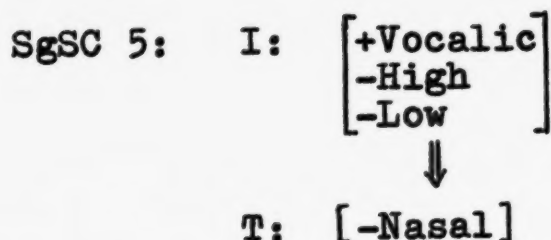
This condition states, first, that those vowels which are distinctively low are all classified as front vowels. (For a justification of the decision to classify the low vowels of Akan as [-Back], cf. Section 1.24, Segment Structure Condition 20.) Second, it states that all such vowels are non-coronal. (The non-coronal redundancy of the underlying low tense vowels will in some cases be changed by P-rules, which will differentiate between a low tense coronal vowel [æ] and a low tense non-coronal vowel [ə].) Finally, this condition also states that low vowels cannot be high vowels. (This part of the rule, as well as its counterpart in the next rule ([+High] → [-Low]), will have to be stated in any phonology unless a set of universal marking conditions are utilized which would include the fact that:



At the present time such a set of universal marking conditions has merely been suggested, and is very incomplete. We are therefore required to state the incompatibility of the specifications [+High] and [+Low] for vowels.



This condition states that a high vowel cannot be low (see above) and also that a front high vowel is redundantly coronal. (In the discussion on the features given by Chomsky and Halle (1968), they suggest that all vowels are redundantly [-Coronal]. However, their suggested correlate of the feature [Coronal] (see above) would appear to contradict this, since certainly in the articulation of high or mid front vowels the blade of the tongue is raised above the neutral position. Furthermore, we have found that by utilizing the intrinsic phonetic content of the feature, we are able to state a number of the P-rules in a way which seems to provide a linguistically significant generalization which otherwise could not be stated.)



This condition states that the mid vowels /ɛ, e, ɔ, o/ are intrinsically non-nasal. Phonetically, when they

precede a nasal segment, the velum may lower during the articulation of the vowel; phonologically, there are no morphemes which are distinguished by contrasts between nasal and oral vowels of this set. Furthermore, there are no morphemes which contain a nasal consonant followed by a vowel from this class. Since we are predicting all prevocalic nasal consonants from a following nasal vowel, this is further justification both for the lack of nasal consonants in the underlying matrices and for this Segment Structure Condition. (A few words, such as Ak-As anopa [ànǒpá] 'morning', would seem to constitute exceptions. The root of anopa, i.e., -nopa, is a compound derived ultimately from da [dá] 'day' and -pa [pá] 'good, genuine'. The plural of da is Ak-As nna [nná]/Fa nda [ndá], and it seems likely that this plural form may be involved in the derivation of anopa. In any case, it may be noted that the unusual [nǒ] sequence is dialectally restricted. Thus Fante has anapa [ànǎpá], while the Akyem dialect of Akan--which is not dealt with in detail in this study--has adopa [àdòpá].)

1.22 Segment Structure Conditions for Glides.

There are three glides in dictionary matrices: /j, w, h/. (The glide [ʔ] is introduced by certain P-rules.) These three glides are all [-Vocalic, -Consonantal, +Continuant, -Nasal]. Using all the other distinctive features which pertain to [-Vocalic] segments, the glides can be fully represented as in Table 4.

	+High -Low +Voiced	-High +Low -Voiced
+Coronal -Back	j	
-Coronal -Back	w	h

Table 4

Segment Structure Conditions 6 through 10 state the segmental redundancies which apply specifically to these glides.

SgSC 6: I: $\begin{bmatrix} -\text{Vocalic} \\ -\text{Consonantal} \end{bmatrix}$
 $\Downarrow$
 T: $\begin{bmatrix} +\text{Continuant} \\ -\text{Nasal} \end{bmatrix}$

This condition states that all glides are oral continuants.

SgSC 7: I: $\begin{bmatrix} -\text{Vocalic} \\ -\text{Consonantal} \\ \alpha\text{High} \end{bmatrix}$
 $\Downarrow$
 T: $\begin{bmatrix} -\alpha\text{Low} \\ \alpha\text{Voiced} \end{bmatrix}$

This condition states that the glides /j, w/ which are [+High] are redundantly [-Low] and [+Voiced], whereas the glide /h/ which is [-High] is redundantly [+Low] and [-Voiced]. (We are able to use alpha notation for the features [High] and [Low] in the case of glides where we were unable to use the notation for vowels since there is no glide which is both [-High] and [-Low].)

SgSC 8: I: $\begin{bmatrix} -\text{Vocalic} \\ -\text{Consonantal} \\ \alpha\text{Coronal} \\ +\text{High} \end{bmatrix}$
 $\Downarrow$
 T: [- α Back]

This condition states that [Back] is a redundant feature for the [+High] glides /j/ and /w/. Specifically, the [+Coronal, +High] glide /j/ is [-Back], while the [-Coronal, +High] glide /w/ is [+Back]. (In classifying /j/ as [+Coronal], we once more differ from Chomsky and Halle, who classify it as [-Coronal]. Our decision has

again been based on the phonetic correlates of the feature and on the needs of the phonology.)

SgSC 9: I: $\begin{bmatrix} -\text{Vocalic} \\ -\text{Consonantal} \\ -\text{Voiced} \end{bmatrix}$



T: $\begin{bmatrix} -\text{Coronal} \\ +\text{Back} \end{bmatrix}$

This condition states that the voiceless glide /h/ is redundantly non-coronal and back.

(For the specification of the feature [Tense] in relation to glides, cf. Section 1.23, SgSC 16.)

1.23 Segment Structure Conditions for Consonants.

In dictionary matrices of Akan formatives, eight 'true' consonants (i.e. segments which are [+Consonantal, -Vocalic]) are needed to distinguish morphemes. All of these segments are redundantly [-Vocalic, -Low, -Nasal]. The consonant segments are presented in Table 5.

	+Voiced	-Voiced	
		+Continuant	-Continuant
+Coronal -Back -High	d	s	t
-Coronal -Back -High	b	f	p
-Coronal +Back +High	g		k

Table 5

Segment Structure Conditions 10 through 16 state the segmental redundancies of these segments.

SgSC 10: I: [+Consonantal]



T: [-Vocalic]
[-Nasal]

The specification of the feature [Vocalic] is redundant for [+Consonantal] segments since, as was noted in Section 1.21, there are no systematic-phonemic liquids in Akan. The condition also states that all underlying consonants in Akan are [-Nasal]. (As has previously been mentioned, [+Nasal] consonants, as well as [+Nasal] glides, do occur at the systematic-phonetic level. The [+Nasal] specification of these segments is always the result of P-rules--cf. Section 3.20. One such rule, P 06, nasalizes all voiced non-vowels that precede [+Nasal] vowels. We are aware that this might appear to be a strange analysis, since it is highly likely that historically the reverse process occurred: i.e., the nasalization of vowels resulted from the influence of nasal non-vowels. However, in a description of modern Akan, an attempt to predict the nasalization of vowels from that of adjacent non-vowels would result in positing underlying forms which are so far from the surface forms as to require a set of complicated rules which would obscure rather than reveal the generalities of the present language. On the other hand, the nasalization of non-vowels under the influence of adjacent vowels may be stated quite straightforwardly. If it is true that, historically, the vowels were nasalized under the influence of nasal non-vowels, this process must have occurred farther back than Proto-Akan.)

SgSC 11: I: [+Consonantal]
[αBack]



T: [αHigh]

This condition states that all back consonants are high, and all non-back consonants are non-high. High sounds are defined as those "produced by raising the body

of the tongue above the level that it occupies in the neutral position" (Chomsky and Halle, 1968, p. 304). This feature is used to distinguish the primary articulation of velars (and palatals), which are [+High], from other primary articulations. (The [+High] specification might also be used to represent the secondary articulation of palatalization, but we have chosen instead to represent this secondary articulation by the feature [+Palatal]. Our reason for doing this is that we have wished to show the essentially assimilatory character of palatalization. In Akan, non-vowels are palatalized when they are immediately followed by high or mid front vowels--cf. Section 3.60. Since these vowels and the palatalized non-vowels may both be characterized as [+Palatal], the use of this feature specification, rather than [+High], to mark the palatalized non-vowels, permits a simple and natural statement of the palatalization rule. P 11.)

SgSC 12: I: [+Consonantal]
[+Coronal]

T: [-Back]
[-High]

This condition states that the alveolar ([+Coronal]) consonants /t, d, s/ are redundantly [-Back] and [-High]. Since the features [Back] and [High] refer to articulations using the body of the tongue, and since these consonants are articulated with the blade of the tongue, phonetically as well as phonologically these are redundant features.

SgSC 13: I: [+Consonantal]
[+Back]

↓

T: [-Coronal
-Continuant]

This condition states that in the lexical representation of morphemes there are no velar fricatives, and no velarized consonants, i.e. the only [+Back] consonants are the velar stops /k, g/.

T: [-Voiced
-Back
-High]

This condition states that underlying fricatives are voiceless, and that there are no palatal or velar fricatives. As a result of this condition, the segments /s/ and /f/ need not be marked for voicing, backness, or height.

T: [-Low]

This condition merely states that the feature [$\pm$ Low] is distinctive in Akan only for [-Consonantal] segments: i.e., vowels and glides.

T: $[-\alpha \text{Tense}]$

This condition (which pertains to glides as well as to true consonants) states that tenseness is never distinctive for Akan non-vowels, since all voiceless non-vowels are [+Tense] and all voiced non-vowels [-Tense]. While we are stating here that tenseness is redundant for non-vowels, a more satisfying solution would be to leave the specification for this feature blank, since the "tense" and "lax" non-vowels do not form natural classes with the tense and lax vowels respectively. The only reason that we are including this condition, then, is to illustrate the way in which the [Tense] feature is marked if we follow the Stanley model's requirement that all cells of matrices be specified.

1.24 Segment Structure Conditions for Non-Distinctive Features

As has been stated previously, there are a number of redundant features which we will wish to use to designate

classes of segments in the P-rules, and which are required for phonetic specification. The values of four of these features are given in Segment Structure Conditions 17 through 21.

SgSC 17: I: [-Consonantal
+Voiced]



T: [+Sonorant]

The vowels and the glides /j, w/, which are [-Consonantal] and [+Voiced], are sonorants. /h/, which is [-Consonantal] and [-Voiced], and all true consonants, are obstruents.

SgSC 18: I: [+Vocalic]



T: [-Anterior]

SgSC 19: I: [-Vocalic
αBack
[-Consonantal
-Coronal
βHigh]



T: [-αAnterior
βAnterior]

SgSC 18 says that all vowels are [-Anterior]. SgSC 19 says that the glide [w] and the labial and alveolar consonants are [+Anterior], while the glides [j] and [h] and the velar consonants are [-Anterior].

SgSC 20: I: [-Consonantal
αBack
βCoronal]



T: [αRound
βPalatal]

Back vowels and glides are redundantly round, and front vowels and glides are redundantly non-round. (Akan low vowels are all classified as [-Back]. This classification permits a maximally simple statement of the redundancy

of the roundness feature.) For reasons stated in Section 1.23, we are utilizing the feature [$\pm$ Palatal]. Vowels and glides produced with the tip or blade of the tongue raised to the palate are [+Palatal]; other vowels and glides are [-Palatal].

SgSC 21: I: [+Consonantal]



T: [-Round
[-Palatal]]

This condition thus makes all true consonants redundantly non-labialized, and non-palatalized. The labialized and/or palatalized consonants that occur at the systematic-phonetic level result from the application of P-rules.

1.30 Minimally Specified Contrasting Segments.

Given the set of Segment Structure Conditions specified in Sections 1.21 through 1.24, the inventory of fully-specified contrasting segments presented in Table 1 can be replaced by the inventory of minimally-specified contrasting segments shown in Table 6.

This inventory of segments is presented merely for descriptive purposes and has no explicit theoretical status in this model of generative phonology. Given the Segment Structure Conditions and the lexicon, all the necessary generalities are made about the segmental redundancies in the language. The Sequence Structure Conditions (cf. Chapter 2) will enable us to leave many additional blanks in dictionary matrices.

1.40 Boundary Units

In Section 0.32 we stated that the boundary units, which are marked as [-Segments], are hierarchically related. This hierarchical relationship can be formally stated in MS Conditions, which we shall call Boundary Conditions (BCs).

	j	h	w	p	b	f	k	g	t	ɖ	s	ʃ	e	a	ã	ə	ɛ	ɪ	ĩ	i	ĩ	o	u	ũ	u	ũ
1. vocalic	-	-	-	0	0	0	0	0	0	0	0	0	+	+	+	+	+	+	+	+	+	+	+	+	+	+
2. consonantal	-	-	-	+	+	+	+	+	+	+	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3. coronal	+	0	-	-	-	0	0	+	+	+	+	+	+	0	0	0	0	0	0	0	0	0	0	0	0	0
4. back	0	0	0	-	-	0	+	+	0	0	0	0	0	0	0	0	0	0	-	-	-	+	+	+	+	+
5. high	+	-	+	0	0	0	0	0	0	0	0	-	0	0	0	0	0	0	+	+	+	-	-	+	+	+
6. low	0	0	0	0	0	0	0	0	0	0	0	-	-	+	+	+	+	0	0	0	0	0	0	0	0	0
7. continuant	0	0	0	-	-	+	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8. voiced	0	0	0	-	+	0	-	+	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9. tense	0	0	0	0	0	0	0	0	0	0	0	-	+	-	+	+	+	-	+	+	+	-	-	+	+	+
10. nasal	0	0	0	0	0	0	0	0	0	0	0	0	0	-	+	+	+	-	+	-	+	0	0	-	+	-
11. sonorant	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12. anterior	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13. round	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14. palatal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table 6

SYSTEMATIC PHONEMES OF AKAN

(Segmental Redundancies left blank)
(Tone not included)

BC 1: I: [-Segment]



T: [-F_{1...14}]

where [F_{1...14}] = all segmental features

BC 2: I: [+SnB]



T: $\begin{bmatrix} +PB \\ +WB \\ +FB \\ +SB \end{bmatrix}$

BC 3: I: [+PB]



T: $\begin{bmatrix} +WB \\ +FB \\ +SB \end{bmatrix}$

BC 4: I: [+WB]



T: $\begin{bmatrix} +FB \\ +SB \end{bmatrix}$

BC 5: I: [+FB]



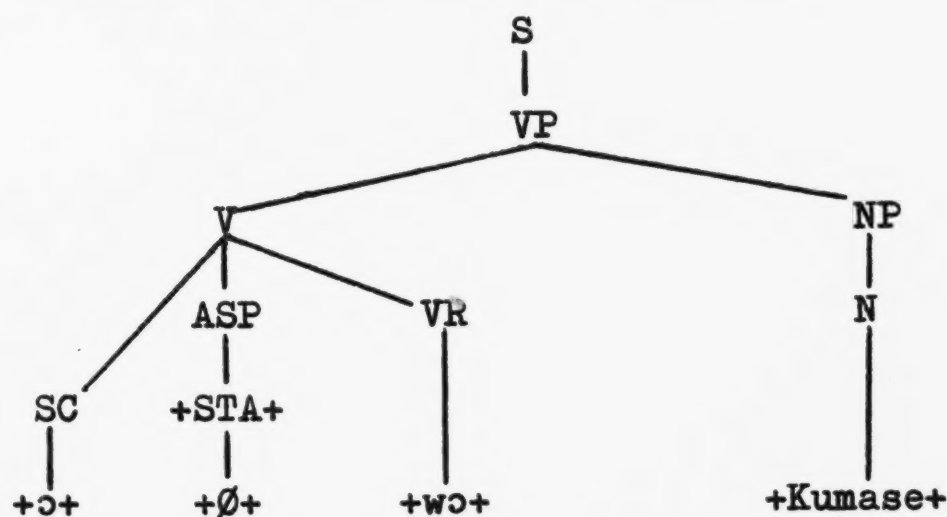
T: [+SB]

Some of these boundary units may be included in the lexicon: e.g., compounds may include a unit marked [+FB] (Formative Boundary), as in Ghanani (Ghana + ni) 'Ghanaian', where ni (from o + ni 'person') is a derivational suffix added to the name of a place to designate a person who comes from that place. (If rules of derivational morphology are included in the grammar, many compounds can be derived by rule, and thus need not be listed as separate dictionary items.) (For a discussion of the status of certain syllable boundaries in the lexicon, cf. Section 2.20.)

By convention formative boundaries are automatically added at the beginning and end of each dictionary (lexical and grammatical) entry. This is necessary since certain MS Conditions and P-rules apply only to strings of segments preceded and followed by a [+FB]. Thus while Ghanani has only one [+FB] unit specified in the dictionary, by convention the form as it would appear in the surface structure would be $N[+gana+ni+]$. (In certain cases we will require special rules for the deletion of [+FB]. One such rule, P 14, eliminates formative boundaries between subject-concord prefixes and aspectual morphemes. For further discussion of this rule, cf. Section 4.32.)

Other conditions and P-rules apply only to strings preceded and followed by [+WB] (Word Boundary). We shall follow the convention suggested by Chomsky and Halle (1968, p. 366) that "the boundary # is automatically inserted at the beginning and end of every string dominated by a major category, i.e. by one of the lexical categories 'noun', 'verb', 'adjective', or by a category such as 'sentence', 'noun phrase', 'verb phrase' which dominates a lexical category."

The derived surface structure of the sentence Ɔwɔ Kumase 'He's in Kumase' would be, roughly:



Using the above convention, this tree may be represented by the labeled bracketing:

$S[\#_{VP}[\#_V[\#_{SC}[+ɔ+]]_{ASP}[STA[+\emptyset+]]_{VR}[\#+wɔ+\#]\#]_{NP}[\#_N[\#+Kumase+\#]\#]\#]$

(Verb Root (VR) is a lexical category in Akan.) A word is defined as a string of units which is bounded by at least two occurrences of # on each side, where no two co-terminous units within this string are themselves #. Omitting the labeled brackets from the above string, we can illustrate this definition. In the string ###+ɔ++Ø+#+wɔ+####+Kumase+###, ##+ɔ++Ø+#+wɔ+## is a word, and ##+Kumase+## is a word. But +ɔ+, the Subject Concord formative, is not a word, nor is the Stative morpheme, nor is the Verb Root +wɔ+.

The Sentence Boundary ([SB]) and the Phrase Boundary ([PB]) represent a phonetic pause. The Sentence Boundary is automatically inserted after a word which is followed by no further segments. The Phrase Boundary is inserted by P-rules (which are not formalized in this phonology) in certain syntactic constructions.

1.50 The Exclusion of Traditional Phonemic Features.

The segments discussed in Sections 1.10 through 1.30 are what have traditionally been called morphophonemes. We believe that Chomsky (1964) has adequately demonstrated that a "taxonomic-phonemic" level between the morpho-phonemic (or systematic-phonemic) and systematic-phonetic levels has no theoretical justification. It is for this reason that the set of contrasting consonantal segments in Tables 1 and 6 is much smaller than would be found in a taxonomic phonology. While it is true, for example, that "phonemically" one finds contrasts between palatalized and non-palatalized segments--e.g., kyekye [tɕitɕɛ] 'divide (reduplicated)', keka [kiká] 'remain (reduplicated)', ksse [kèsí] 'big'--palatalization can be predicted if boundaries and syntactic information are available for the statement of P-rules, and if the rules are ordered.

In the next chapter, which deals with sequential redundancies, and particularly in Chapter 3 and pertinent sections of Chapter 4, which discuss P-rules, we shall attempt to justify our analysis, showing that phonetic phenomena such as palatalization, labialization, nasalization of consonants, etc. are predictable, and hence need not be specified in dictionary matrices.

Chapter 2

Sequence Structure

2.10 Sequential Constraints on Segments.

The blanks which are present in the dictionary matrices representing Akan formatives may reflect either segmental or sequential redundancies. The segmental redundancies--i.e., those present within a single segment regardless of the context in which the segment occurs--are specified by the set of Segment Structure Conditions (SgSCs) presented and discussed in Chapter 1. The sequential redundancies--i.e., those that depend upon the phonological or syntactic contexts in which segments occur--are specified by a set of Sequence Structure Conditions (SqSCs), to be presented and discussed in the present chapter. (Certain SqSCs that apply specifically to verb roots are, however, given separate treatment in Section 4.75.)

Some sequential constraints are general: i.e., they are reflected in all formatives in the language; others are reflected only in formatives belonging to particular lexical or grammatical categories. For example, regular verb roots (VRs) in Akan are either monosyllabic or disyllabic, while regular noun roots do not show this restriction. Such a condition on the structure of VRs can be formalized as a Positive Condition (PC):

PC : VR[X = (X)]

(Where X does not include a syllable boundary (=)
and where the parentheses indicate an optional
element)

If a dictionary matrix which belongs to the category VR does not meet this condition, it must be marked with a diacritic feature (cf. Section 0.60) indicating that it is exceptional in this respect. (There are a few trisyllabic verb roots, probably derived as compounds historically, which are marked with such a diacritic feature.)

By a convention established in Section 0.60, the syntactic category of a formative automatically becomes a distinctive feature of all its segments. Such syntactic features enable us to state the categorial limitation of a condition within the condition itself. For example, there is a sequential constraint on disyllabic VRs to the following effect: if the vowel of the second syllable is /U/ (i.e. [+Back,+High]), then the vowel of the first syllable must also be /U/. This may be stated formally (as an I-TC) in two different ways. The first statement--(a), below--utilizes the spreading of syntactic features to the segments; the second--(b)--uses labeled brackets instead.

$$\begin{array}{c}
 \text{I-TC: (a) I: } X \begin{bmatrix} +\text{Vocalic} \\ +\text{VR} \end{bmatrix} X = X \begin{bmatrix} +\text{Vocalic} \\ +\text{Back} \\ +\text{High} \\ +\text{VR} \end{bmatrix} X \\
 \downarrow \\
 \text{T: } \begin{bmatrix} +\text{Back} \\ +\text{High} \end{bmatrix} \\
 \\
 \text{(b): I: } VR[X \begin{bmatrix} +\text{Vocalic} \end{bmatrix} X = X \begin{bmatrix} +\text{Vocalic} \\ +\text{Back} \\ +\text{High} \end{bmatrix} X] \\
 \downarrow \\
 \text{T: } \begin{bmatrix} +\text{Back} \\ +\text{High} \end{bmatrix}
 \end{array}$$

The (a) and (b) forms of the condition are equivalent. In the writing of MS Conditions and P-rules, we shall sometimes use one notation and sometimes the other.

Most SqSCs apply to all formatives without reference to a particular lexical category. In such cases, no syntactic feature (or labeled bracket) is included in the condition. For example, syllable-final non-vowels are, in all formatives, limited to the set of stop consonants. Hence no syntactic feature is required in the formalization of a condition to this effect.

2.20 The Structure of the Syllable.

Specifying the structure of the Akan syllable makes it possible to state many generalities about sequential constraints in a simple fashion. While no theory at

present provides a viable definition for either a phonological or a phonetic syllable, there seems to be general agreement that the syllable is an important phonological unit in many languages, possibly in all languages. For example, native speakers intuitively 'know' how many syllables occur in an utterance. (Bailey and Milner (1967) have suggested that the feature [Vocalic] be replaced by a feature [Syllabic]. On the phonetic level all segments which are marked [+Syllabic] belong to separate syllables. Vowels are inherently [+Syllabic], but become [-Syllabic] if they are replaced by glides; non-vowel sonorants occurring between two obstruents become [+Syllabic], etc. While this might provide a solution on the phonetic level, it would not help to define the phonological syllable in Akan, since on the systematic-phonemic level, Akan syllables may have two vowels, one of which is later deleted by P-rules.) Although we cannot define the concept "phonological syllable" precisely, utilizing this concept enables us, for example, to avoid stating separately those constraints on morpheme-medial consonants which may be more generally stated as constraints on syllable-final and syllable-initial consonants. Furthermore, there are some P-rules which pertain only to monosyllabic Verb Roots, others only to disyllabic roots. These can be stated in a clumsy fashion without reference to the syllable, but we believe that the fact that they can be stated very much more simply if the syllable is referred to in itself indicates that the syllable has a phonological status which should be revealed.

Every Akan phonological syllable has at least one vowel segment which bears tone, and every syllable has one and only one distinctive tone. Tone is non-distinctive for consonants in the dictionary representation of morphemes. These statements pertain to both lexical and grammatical formatives. There are, however, sequential constraints which pertain to syllables in lexical morphemes which do not pertain to those in grammatical morphemes, and vice versa. Christaller differentiates between a principal syllable, and a secondary syllable. We shall adopt this terminology, although our description of the principal (lexical) syllable and secondary (grammatical) syllable will not be equivalent to Christaller's, since his description concerned the phonetic structure of syllables, while ours concerns the systematic-phonemic, or phonological, structure.

In Akan the occurrence of syllable boundaries is predictable from the sequences of segmental units. This fact requires some further discussion of the model we are using. Thus far, we have been employing the notion of redundancy to mean that a feature value in a dictionary matrix "can be left blank and later predicted" (Stanley, p. 433). However, as Stanley has pointed out:

If, in some environment E, the value [+f] implies the value [+g] and the value [+g] implies the value [+f] then it would be arbitrary which value we actually choose to indicate in the dictionary...(To) say that a certain fully specified matrix is highly redundant in some language is actually to say that many of its feature values are interrelated in ways determined by the constraints of the language, and it is simply the statement of these constraints (in the MS Conditions) which constitutes the most natural characterization of the redundancy of language. Once these constraints have been stated, it is true that they may be utilized... in giving dictionary representations in their most economical form; but this is a secondary fact, and these redundancy-free representations play no real role in a theory of redundancy. (Stanley, 435)

In other words, it is the MS Conditions themselves which define the redundancies, and not the blanks which may be left in the dictionary matrices. We have chosen, nevertheless, to represent the dictionary matrices in their most economical form: i.e., using blanks. This presents no problems until we wish to describe the inter-relationship of certain features in a non-arbitrary way and are unable to make a non-arbitrary choice.

Such a situation exists in describing the Akan principal syllable. The occurrence of syllable boundaries ([+SB]s) can be generalized in an If-Then Condition as follows:

SqSC 1: I: [] [-Vocalic][+Vocalic]

T: $\begin{bmatrix} -\text{Segment} \\ +\text{SB} \end{bmatrix}$

This condition states that a syllable boundary occurs before every non-vowel which is followed by a vowel. In a formative with the form CVCV, a syllable boundary occurs before both the first and the second non-vowels since they are both followed by vowels, but in a formative with the form CVC, a syllable boundary occurs only at the beginning of the formative, since the final consonant is not followed by a vowel, but by a [-Segment].

Given the hierarchy and dependency of boundary units (cf. Section 1.40), it is unnecessary to use SqSC 1 to insert a syllable boundary at the beginning of a formative, since the presence of a formative boundary [+FB] in this position automatically implies--cf. BC 5--that a syllable boundary is present as well. SqSC 1 is, however, required to correctly predict the placement of medial syllable boundaries in formatives of the shapes CVC=CV, CVV=CV, etc. But while it is true that medial syllable boundaries may be correctly predicted if (and only if) the [$\pm$ Vocalic] specification of subsequent segments is known, it is also true that the [$\pm$ Vocalic] specification of these segments may be correctly predicted if (and only if) it is known where syllable boundaries occur. For example, it may be predicted that the first two segments after a medial syllable boundary are a true consonant and a vowel. Yet at the same time the occurrence of the syllable boundary may be predicted from the occurrence of two such segments after it.

Since we wish to utilize blanks in the dictionary matrices for descriptive purposes--i.e., since the blanks show at a glance which features are redundant--we shall represent the dictionary matrices with medial syllable boundaries given, enabling us to leave blank those segmental features which depend on their presence.

2.21 The Structure of the Principal Syllable.

The Akan principal syllable may be symbolized as:

= C (V) V (C) =

and specified by the Positive Morpheme Structure Condition SqSC 2.

SqSC 2:

$$PC: = [-Vocalic] < \left[\begin{array}{c} +Vocalic \\ +High \\ +Back \\ \alpha Tone \\ \beta Nasal \\ \gamma Tense \end{array} \right] > \left[\begin{array}{c} +Vocalic \\ <-Back> \\ \alpha Tone \\ \beta Nasal \\ \gamma Tense \end{array} \right] ([+Consonantal] [-Continuant]) =$$

(where = is a feature complex specified as $\left[\begin{array}{c} -Segment \\ +SB \end{array} \right]$)

(Note: Where $[-Segment]$ is not specified for a unit, this unit is understood to be $[+Segment]$.)

SqSC 2 combines into one MS Condition a number of separate sequential constraints:

(1) It states that there are four possible phonological structures for the Akan principal syllable: (a) =CVVC=, (b) =CVC=, (c) =CVV=, (d) =CV=. Examples are: (a) =CVVC=, twɛn from /kɛsɛ/ 'wait', (b) =CVC=, bam from /bab/, 'embrace', (c) =CVV= hwe from /hɛs/ 'look at', (d) =CV=, wɔ from /wɔ/ 'be in'. Examples can also be cited for syllables in disyllabic or polysyllabic morphemes: e.g., kita /kite/ 'hold', a CV=CV formative, nanse /dãdɛ/ 'spider', a CVC=CV formative, tweri /tuedi/ 'lean against', a CVV=CV formative, bankam /bagkab/ 'amber bead', a CVC=CVC formative, -berante /bedadɛ/ 'young man', a CV=CVC=CV formative, etc.

(2) It states that the initial segment of a principal syllable must be a true consonant or a glide.

(3) It states that the second segment of the syllable must be a vowel.

(4) It states that in a syllable with two vowels the following conditions obtain:

(a) The first vowel is /U/. (This vowel will be deleted by a P-rule after the preceding non-vowel has been labialized because of its presence.)

(b) The second vowel is /I/, /E/, or /A/-- i.e., one of the $[-Back]$ vowels.

(c) The two vowels agree in their specifications for the features $[Tone]$, $[Nasal]$, and $[Tense]$: i.e., if one is $[+Tone]$, so is the other; if one is $[-Nasal]$,

so is the other, etc. (SqSC 6 will stipulate that all vowels within an entire morpheme agree in tenseness. Therefore the specification of tenseness agreement in SqSC 2 is unnecessary, and is included only for expository purposes.)

(Given this condition, together with certain Segment Structure Conditions, it is unnecessary to specify any of the features of the first vowel of a vowel sequence in dictionary matrices. In addition to the features predicted by this condition, the features [-Consonantal, +Voiced, +Continuant] and [-Coronal, -Low] are predicted for this vowel by SqSC 1 and SqSC 2 respectively.)

(5) It states that a final segment, if [-Vocalic], must also be [+Consonantal] and [-Continuant]: i.e., a final non-vowel is a true consonant and not a glide, and furthermore, it is a stop consonant rather than one of the continuants /f/ and /s/.

(6) It states that, given a principal syllable with four segments, the third segment must be a vowel and the fourth a true consonant.

If there were a set of universal marking conventions which stipulated an unmarked structure for syllables, it is likely that this structure would be CV, with C standing for a true consonant: i.e., a segment which is [-Vocalic, +Consonantal]. This would leave as unmarked for the feature [Consonantal] the first segment of the majority of Akan syllables, since in most of the formatives the initial segment is a true consonant. However, since we are working with a model which does not include such a set of conventions, we are required to mark the initial segment for this feature.

SqSC 2 permits us to leave many cells blank in dictionary matrices: e.g., the seven blanks in the following partial-matrix for the VR Ak-Fa gua/As dwa 'skin':

	+ g u e k +						
Segment	-	+	+	+	+	-	
Vocalic		0	0	0	0		
Consonantal		+	0	0	0		

(In a full matrix for this formative, a number of other cells are left blank by virtue of the condition under discussion: e.g., the [High] and [Back] cells for /u/, the [Back] cell for /ə/, and the [Continuant] cell for /k/. The Akuapem-Fante phonetic form [gweʔ] results from the application of P-rules which labialize the /g/, delete the /u/, and replace the /k/ by [ʔ]. Additional P-rules are involved in the derivation of the Asante phonetic form [dʒweʔ].)

It may be noted that, while SqSC 2 has constrained final non-vocalic segments of primary syllables to the set of stop consonants, none of these consonants is left intact by the P-rules in this position. Specifically, /p/ → [w], /t/ → [r], /k/ → [ʔ], /b/ → [m], /d/ → [n], and /g/ → [ŋ]. In some cases, subsequent P-rules may apply to alter these final non-vowels still further.

A syllable-final consonant that is not also morpheme-final shows further certain constraints, which are captured in SqSC 3:

$$\begin{array}{l} \text{SqSC 3: } I: X [+Consonantal] = \begin{bmatrix} \alpha \text{Coronal} \\ \beta \text{Back} \\ \gamma \text{High} \end{bmatrix} \\ \quad \quad \quad \downarrow \\ \quad \quad \quad T: \begin{bmatrix} \alpha \text{Coronal} \\ \beta \text{Back} \\ \gamma \text{High} \\ +\text{Voiced} \end{bmatrix} \end{array}$$

This condition states that a syllable-final, morpheme-medial consonant (which has already been specified as a stop by SqSC 2) is redundantly voiced, and is homorganic with the initial segment (necessarily a non-vowel) of the following syllable. Phonetically, all such syllable-final, morpheme-medial consonants are realized as nasals, as the result of the operation of a P-rule which nasalizes voiced syllable-final consonants.

(An alternative way of accounting for the (systematic-phonetic) limitation of syllable-final, morpheme-medial consonants to nasals homorganic with the following non-vowel would have been to leave consonants in this position specified as [-Vocalic] archisegments until the P-rules, and to have let the latter account for the homorganicness, as well as the nasality, of these consonants. We have,

however, chosen to express the generalization about the homorganic character of the consonants in a Sequence Structure Condition, in conformity with the requirement of the model with which we are working that all features of segments be specified, wherever possible, in inputs to the P-rules.)

Below is a partial redundancy-free dictionary matrix for the medial consonants of nanse 'spider', and the same matrix mapped onto certain SgSCs and onto SqSC 3:

	<u>Dictionary Matrix</u>		<u>By SgSCs</u>		<u>By SqSC 3</u>	
	+dād = si+		+dād = si+		+dād = si+	
Coronal	0	+	0	+	+	+
Back	0	0	0	-	-	-
High	0	0	0	-	-	-
Voiced	0	0	0	-	+	-

(The [-Back, -High] specification of /s/ is provided by SgSC 12, the [-Voice] specification by SgSC 14. SgSC 14 depends on the [+Consonantal, +Continuant] specification of /s/, which has been omitted from the above partial matrices.)

SqSC 3 concludes the list of SqSCs that apply to principal syllables. There is one SqSC (SqSC 8) that may be said to apply to secondary syllables--i.e., the syllables of grammatical morphemes--but this condition, since it also constrains the number of syllables that may occur in grammatical morphemes, is best considered in connection with a general account of the phonological properties of such morphemes, and is reserved for presentation in Section 2.50.

2.30 The Structure of Root Morphemes

The root or stem morphemes are the formatives which Christaller called "simple stems", the "real primitives of the language" (1875, p. 17). He limited such stems to sequences of one to three syllables, and differentiated

them from derived or compound words. With regard to the latter, however, he added a note to the effect that "Derivatives in form...may be considered as primitives in meaning, when no simpler word still existing in the language can be shown, from which they are evidently derived" (p. 18).

In present day Akan (with some exceptions), this limitation on the size of formative strings still exists. (Furthermore, most morphemes consist of either one or two syllables, with three-syllable morphemes being considerably less common, and most of them probably derived stems or compounds.) Noticeable exceptions to this constraint are loan words and ideophones. The dictionary matrices of these two sets of formatives can be marked [+Foreign] or [+Ideophone]. A more complete phonology of Akan would present the special conditions and Phonological Rules which are applicable to formatives marked with these features.

We can therefore state a condition defining the set of all root morphemes in either of the two following, equivalent, ways.

SqSC 4:

PC: +X (=X) (=X)+

(where X does not include a syllable boundary.)

SqSC 4¹:

PC: +[Syl]₁³+

(The subscript and superscript notation in SqSC 4¹ means that any formative must have a minimum of one (the subscript) and a maximum of three (the superscript) syllables.)

As was indicated above, a formative such as Enyiresi 'England', or Amsrika 'America' would be marked [+Foreign] and thereby not constrained by SqSC 4. A compound like gyaasekse 'a large court in a king's house' is derived from gya-ase (itself a compound, literally 'fire-bottom' or '(a place) under the fire') plus ksse 'large'. The dictionary entry for such a compound would be something like: N_N[N_N[gya]_N[a+se]]_A[ksse]]. (The a of a+se is a nominal prefix. Ordinarily it would not be listed in the dictionary entry but be inserted by a Transformational

Rule. In many compounds, however, medial nominal prefixes are omitted from the compounded word, and we list the prefix here since it is retained. An alternative listing would mark the noun *se* in this compound as minus the rule for deletion of nominal prefixes in compounds, thereby retaining the prefix.) The phonological string of this compound would be /+++ga++a+si+++kesi+/, and the constraint on the number of syllables per formative would apply.

2.31 Vowel Tenseness Harmony.

SqSC 5:

PC: $+X \left[\begin{smallmatrix} +\text{Vocalic} \\ \alpha\text{Tense} \end{smallmatrix} \right] * X+$

(where X does not include [+FB]: i.e., +)

This condition states that all the vowels in any one morpheme are either tense or lax. (The asterisk is a symbol for iteration, meaning here 'any number of segments specified as [+Vocalic]'.) In dictionary matrices we have arbitrarily decided to mark the first vowel for the feature [Tense] (cf. Section 0.40) but any vowel would serve.

We could state this condition on vowels in an alternative but equivalent condition, SqSC 5¹.

SqSC 5¹:

PC: $+X \left[\begin{smallmatrix} +\text{Vocalic} \\ \alpha\text{Tense} \end{smallmatrix} \right] Y \left[\begin{smallmatrix} +\text{Vocalic} \\ \alpha\text{Tense} \end{smallmatrix} \right] X+$

(where X and Y include no +, and Y includes no [+Vocalic] segment)

Formulated in this manner, the condition specifies that any two vowels within a morpheme agree in tenseness. In a three syllable formative, the condition would apply to two of the vowels, and then apply again.

This formulation avoids the use of the iterative symbol, which has certain advantages. Since the number of vocalic segments within a formative is limited by SqSC 4, a condition on formatives which refers to indefinitely many such segments may seem counter-intuitive.

Tenseness harmony in Akan is not confined to single formatives. It generally characterizes sequences of root morphemes and adjacent grammatical morphemes within word

boundaries, and applies, in a more limited way, across word boundaries. Examples of tenseness harmony within nouns are As afes [afɛ] 'year' and As afie [æfie] 'houses'. ([æ] is the phonetic form taken by /a/ or /ə/ before a tense vowel in the next syllable--cf. Section 3.71.) Both of these words consist of a nominal prefix ([a] and [æ] respectively), a noun root ([fɪ] and [fi]) and a nominal suffix ([ɛ] and [e]). All the vowels of afes are lax, all those of afie tense. Examples of tenseness harmony within verbs are Ak-As obeyse [ɔbeɪsɪ] 'he came and did (it)' and Ak-As obeyii [ɔbeɪji] 'he came and removed (it)'. Both of these words consist of a subject-concord prefix ([ɔ] and [o] respectively), an ingressive prefix ([bɛ] and [be]), a verb root ([jɛ] and [ji]), and a past suffix ([ɪ] and [i]). All of the vowels of obeyse are lax, all those of obeyii tense.

While it might have been possible to extend SqSC 5 to apply to such tenseness-harmony constraints within the word, we have preferred to characterize the latter by means of a P-rule (P 69), for a number of reasons. One of these is the way in which tenseness harmony across word boundaries (which must obviously be characterized by a P-rule) operates. Across word boundaries a [-Tense] vowel at the end of one word is made [+Tense] when the following word begins with a root with a [+Tense] vowel, but not when the following word begins with a grammatical morpheme (i.e., a prefix) with a [+Tense] vowel. Thus the [-Tense] final vowel of Ak Amma [amma] 'Amma' is made [+Tense] when it immediately precedes the root yi 'remove' as in Ak Amma yii [ammæ jii] 'Amma removed it'. But this vowel is not made [+Tense] when it immediately precedes the [+Tense] prefix [be], as in Ak Amma beyii [amma beɪji] 'Amma came and removed it'. These facts would indicate that the vowel of the prefix realized as [be] in beyii is inherently lax (as are, in our opinion, all vowels in grammatical prefixes), and is still lax at the point in the operation of the P-rules at which the rule of vowel tensing across word boundaries applies.

Further, there seems to be a close relation between vowel harmony across word boundaries and vowel harmony within word boundaries (but across morpheme boundaries) in the case of compounds. In both cases, the vowel harmony is strictly regressive, changing a [-Tense] vowel before

a [+Tense] vowel (but not a [-Tense] vowel after a [+Tense] vowel) to [+Tense], is limited in its effect to one syllable, and never changes [+Tense] vowels to [-Tense]. An example of the operation of vowel harmony within a compound is provided by Ak Kumaseni [kūmasini] 'person from Kumase', which consists of the compound stem Kumase 'Kumase' (in turn analyzable into the root kum [kūm] and the noun ase [asi]) and the derivational suffix (originally a root) ni [nī] 'person'. We observe in this form: (a) that the vowel tensing is regressive, since the tense vowel of [nī] changes the preceding [ɪ] to [i], but the tense vowel of [kūm] does not change the following [a] to [æ] (or [e]); (b) that the tensing is limited in its affect to one syllable, since although the [ɪ] of [asi] is made [+Tense] by the following [+Tense] vowel, the [a] of [asi] is unaffected; (c) that lax vowels have no effect on preceding tense vowels, since the [ū] of [kūm] is not changed to [ũ] before the lax [a] of [asi]. Similar examples may be cited for the operation of tenseness harmony across word boundaries: e.g., As Kum ase yi [kūm asi ji] 'Kill this father-in-law', which consists of the words kum [kūm] 'kill', ase [asi] 'father-in-law', and yi [ji] 'this (one)'.

Such evidence points to the desirability of a unified treatment of tenseness harmony across word boundaries and tenseness harmony within the word. Since the former can only be dealt with by means of a P-rule, we shall deal with the latter in this way as well, and limit SqSC 5 to the characterization of tenseness harmony within single morphemes (which, in any case, is very much more general than is tenseness harmony across morpheme boundaries, whether or not these boundaries are also word boundaries).

Vowel harmony has been discussed in many articles dealing with the phonology of Akan. Stewart (1967) discusses the phonetic realization of what we are calling "tenseness", and presents apparently conclusive evidence for his position, which he summarizes as follows:

The vowels of Akan fall into two sets on the basis of vowel harmony: ɪ, ɛ, a, ɔ, u and i, e, ɜ (our ə or æ) o, u. The relation of the first set to the second is one of unmarked to marked, so that one would expect to find a constant articulatory feature extending throughout

harmony spans with i, e, ɜ, o, u. Tongue raising is unacceptable because there is no constant tongue height, and tenseness is unacceptable as in the unmarked vowels laxness is conspicuously absent. Advancing of the root of the tongue, on the other hand, is acceptable, and appears to account, moreover, for all the phonetic phenomena which have been found to be associated with this particular type of vowel harmony. (p. 202)

It should be noted that we use the terms 'tense' and 'lax', or [+Tense] and [-Tense], only as classificatory (phonological) features. For final phonetic specification, all [+Tense] vowels can be interpreted as vowels in which the tongue root is advanced, in contrast with their [-Tense] counterparts where the tongue root is not advanced.

2.32 Other Restrictions on Vowels

In morpheme-initial position the consonant /g/ is followed only by [-Nasal] vowels. Further, if there is only one vowel in a morpheme-initial syllable introduced by /g/, this vowel must be [+Tense]. These restrictions are captured in SqSC 6 and SqSC 7 (which might have been combined, with some notational complexity, into a single condition):

SqSC 6:	
I:	$\begin{bmatrix} +\text{Consonantal} \\ +\text{Back} \\ +\text{Voiced} \end{bmatrix} ([+\text{Vocalic}]) [+ \text{Vocalic}]$
	↓
T:	[-Nasal]
SqSC 7:	
I:	$\begin{bmatrix} +\text{Consonantal} \\ +\text{Back} \\ +\text{Voiced} \end{bmatrix} [+ \text{Vocalic}] ([+\text{Consonantal}]) =$
	↓
T:	[+Tense]

SqSC 6 accounts for the fact that, while /guɪ/ (dwe [dʒuɪ] 'kernel') and /gi/ (as in /gidə/ (gyina [dʒinə])

'stand') are possible morpheme-initial syllables, */gũĩ/ and */gĩ/ are not. (For morphemes with initial /gV̄V/, such as /gũĩ/, only the second vowel is specified as [-Nasal] by SqSC 6. However, this entails that the first vowel is also [-Nasal], since SqSC 2--cf. Section 2.21--requires that two vowels in the same syllable agree with respect to nasality.) SqSC 7 accounts for the fact that while /gi/, /gu/ (gu [gu] 'pour'), and /gə/ (gya [dʒə] 'fire') are possible morpheme-initial syllables (as is, e.g., /gap/ (gya(w) [dʒə(w)?] 'leave'), */gi/, */gu/, and */ga/ are impossible (as is, e.g., */gap/).

Neither of these restrictions applies to vowels following a syllable-initial /g/ that is not morpheme-initial. Thus, in our analysis, the underlying forms of the verb roots nan(e) 'melt' and boa 'help' are /dāgĩ/ and /buga/ respectively (cf. Section 4.77).

There is no evidence at present which provides any explanation for these anomalous restrictions. It seems likely that in proto-Akan, an underlying /g/ existed, and whether or not these same restrictions existed in the very earliest forms of the language, examples given by Koelle indicate that the restriction was probably present in the Asante spoken in the early nineteenth century.

(It may be noted that Christaller's dictionary lists one item, gaga [gaga] 'the noise made by the chattering of the teeth or by the cutting of bones' that is an apparent exception to SqSC 7. This word is an "ideophone": i.e., it belongs to a class of words, found in many African languages, which C. M. Doke, who first used the term, characterized as "vivid representation(s) of an idea in sound" (1935, p. 118). Such words are often distinguished from other formatives in a language by the fact that they deviate from the general phonological constraints. A dictionary entry marked by the feature [+Ideophone] would therefore not be constrained by the more general morpheme structure conditions. The modern word Ghana ([gana]) is also exceptional.)

There is one further restriction on vowels in root morphemes, having to do with the distribution of the low tense vowels /ə/ and /ẽ/. This restriction is to the following effect: the low tense vowels are never the only vowels in root morphemes, except that /ə/ may occur

as the only vowel if it is immediately preceded by /g/. What this restriction indicates is that the [+Low, -Tense] vowels [a] and [ã] are "normal", or "unmarked", and that the occurrence of [+Low, +Tense] vowels depends either upon harmony with a non-low tense vowel in the same morpheme (i.e., upon the limitation imposed by SqSC 5) or upon the fact that the vowel is immediately preceded by a consonant that cannot be followed by a lax vowel (i.e., upon the limitation imposed by SqSC 7). This restriction upon the distribution of low tense vowels is captured in SqSC 8:

SqSC 8:

I: +X $\begin{bmatrix} +\text{Vocalic} \\ +\text{Low} \end{bmatrix}$ Y+

↓

T: [-Tense]

(where either:

- (a) no [+Vocalic, -Low] segment occurs in X or Y; or
- (b) X does not end in a [+Consonantal, +Back, +Voiced] segment--i.e., /g/)

What this condition says is that any [+Low] vowel must also be [-Tense] unless one of the following conditions is met: (a) there is a [-Low] vowel somewhere else in the morpheme; (b) the [+Low] vowel is immediately preceded by /g/.

The condition predicts that while there are morphemes of such shapes as /ba/ (ba 'child'), /kã/ (ka 'say'), /kasa/ (kasa 'speak'), etc., */bã/, */kã/, and */kãse/ are impossible. It does not, however, exclude such morphemes as /suæk/ (sua [swə?] 'be small'), bisa (bisa 'ask'), or /kēdī/ (kani [kēnī] 'species of yam'), which contain [-Low] vowels as well as [+Low] vowels, or /gə/ (gya [dʒə] 'fire'), in which the [-Low] vowel is immediately preceded by /g/.

2.33 Dialectal Restrictions

Sections 2.30, 2.31, and 2.32 present the major general sequential constraints in Akan. Were we writing a phonology of any one of the three dialects we are considering, there would be other constraints which pertain to the individual dialect.

For example, the mid tense vowels [e] and [o] never occur in an Asante monosyllabic root. Where Akuapem has [e] in such a root, Asante generally has [ɪ] (as in gye 'receive', Ak [dʒe]/As [dʒɪ]), and where Akuapem has [o], Asante generally has [u] (as in so(w) 'hatch', Ak [sow?]/As [su?]). We can deal with this constraint by a P-rule, unique to Asante, which changes underlying /e/ and /o/ in monosyllabic roots to [ɪ] and [u] respectively. (This P-rule is not formulated in the present text.)

There are other dialect-specific constraints which can be similarly dealt with by means of dialect-specific P-rules.

2.34 Restrictions on Particular Lexical Categories

The Sequence Structure Conditions SqSC 1 through SqSC 8 are applicable to all the lexical categories which are generated by the syntactic component of the Akan grammar. We deal in detail with Sequence Structure Conditions which are specific to the Verb Root in Chapter 4. It is only the phonology of the Verb which is more or less complete in this description. There may be specific constraints relating to Nouns, Adjectives, and Adverbs which are not dealt with in this treatment.

We are also not presenting the special phonological properties of ideophones or loan words. Loan words would require additional systematic phonemes. For example, boɔl [boɔl] 'ball' has a final lateral liquid which is not present in any native morphemes.

2.40 The Structure of Derivational Morphemes

Derivational morphemes are not added by transformational rules in our description, but are included in dictionary matrices in the same way as compounds. For the most part they may be treated as lexical morphemes, since they obey the sequential constraint applicable to the latter.

The P-rules which apply across word boundaries also apply, in general, within words composed of a root morpheme plus a derivational morpheme.

Christaller lists the suffix -fo in his dictionary as "a noun that is now almost exclusively used as a suffix in names of persons, especially in the pl." (130). When added to a noun root, -fo may add the meaning "agent" as in Ak okuafo, 'farmer', from kua 'farm' plus fo 'person'. The suffix -ni has a similar meaning, and comes from the noun o-ni 'person'. Thus, osikani 'rich person', is derived from sika 'money' plus ni 'person'.

As was noted in Section 2.31, vowel tensing across word boundaries is regressive, and applies only once, to a final lax vowel of a word preceding another word with a tense vowel. It is never progressive: i.e., a tense vowel does not tense a following vowel which is lax. This provides justification for dealing with these derivational morphemes not only as lexical morphemes but as words. The suffix -fo is phonetically always [fu], with a lax vowel. The suffix -ni ([ni], from /di/), on the other hand, always has a tense vowel, and its presence does tense a preceding vowel. Thus in Ak Ghanani [ganāni] 'a Ghanaian' the underlying lax /a/ before ni is tensed, but in Ak Twifo [tɕwiifu] 'Twi people', both the underlying tense /i/ of Twi and the underlying lax /u/ of -fo remain unchanged.

There are a number of other derivational affixes which adhere to these same restrictions. The diminutive suffix wa, derived originally from ba, a stem meaning 'child', is also always lax even when following a root with tense vowels.

No additional Sequence Structure Conditions are needed, therefore, for derivational morphemes.

2.50 The Structure of Grammatical Morphemes

Grammatical morphemes, or formatives, are composed of secondary syllables, which show different constraints from those of the lexical or primary syllables. Grammatical morphemes may be added or altered by transformational rules. Consequently most grammatical morphemes are listed in a special subsection of the Lexicon, (the so-called "second lexicon", in which morphemes that are inserted post-formationally are listed). Like root morphemes, most grammatical morphemes are represented in the Lexicon by feature matrices, with the columns representing segments and the rows representing phonological, syntactic, and diacritic features. However, in some cases, the dictionary matrices

of grammatical morphemes may contain archisegments which are not fully specified by Morpheme Structure Conditions: i.e., they remain partially specified in surface structures. And in other cases there may be no dictionary matrix corresponding to the grammatical morpheme. In such cases the syntactic brackets of the grammatical morpheme are carried down in the derivation until P-rules either add features to it or delete it. For example, whether the reduplicating affix (RED) is introduced into deep structures through the exercise of an optional choice in the base rules, or whether it is present in some particular lexical entry, its phonetic form is always specified entirely by P-rules (cf. Sections 4.60 - 4.64). On the other hand, some grammatical morphemes that are not listed in the lexicon (the "zero morphemes") are never given a phonetic form. Thus the Stative (STA) morpheme and the Imperative (IMP) morpheme have no phonetic segmental form, but are actualized by their tonal effects on the segments of other formatives. These will be symbolized as STA[Ø] and IMP[Ø] in Chapter 4. There is no historical evidence that these morphemes ever had segmental forms.

(The Habitual Morpheme (HAB), however, while it has no surface segmental form, must be specified as having low tone in order to account for the operation of certain P-rules (cf. Section 4.31). This suggests that at some point the habitual morpheme was a low-tone vowel. The segmental features, other than tone, have been lost. We have no non-arbitrary means of deciding what the other features for this vowel are, and will therefore list the HAB morpheme in the grammatical section of the Lexicon as the archisegment [+Vocalic, -Tone] (and refer to it in Chapter 4 as HAB[Ø]). A P-rule will change this to a [-Segment] after the low tone of the morpheme has had its effects. The "zero Nominal Prefix (NomP)"--cf. Section 2.51--is treated in a similar fashion, except that in this case it is possible to suggest, on the basis of the non-occurrence of overt [+High, -Nasal] prefixes, that the archisegment underlying the zero NomP has these features as well as the features [+Vocalic, -Tone].)

The grammatical morphemes that are represented by feature matrices in the lexicon are all monosyllabic, with the syllable being either a single lax vowel, or a non-vowel followed by a single lax vowel. Thus the segmental structure of possible grammatical morphemes can be symbolized as +(C)V+ (and that of secondary syllables as =(C)V=).

The segments of all grammatical morphemes that are listed in the Lexicon will be marked, automatically by convention, with the syntactic feature [+G] (standing for [+Grammatical]). Similarly, the segments of all lexical morphemes will be marked as [-G]. (All of the segments mentioned in SqSCs 1 to 7, above, are to be understood as marked [-G], although this specification has not been made explicit in the formalization of the conditions.)

The shape of grammatical morphemes can be specified by a Sequence Structure Condition, SqSC 9:

SqSC 9:

$$\text{PC: } + \left(\begin{bmatrix} +G \\ -Vocalic \end{bmatrix} \right) \begin{bmatrix} +G \\ +Vocalic \\ -Tense \end{bmatrix} +$$

There are three grammatical morphemes which are realized phonetically as prefixed nasal consonants homorganic with the following non-vowel. These are the negative morpheme (NEG), the Optative morpheme (OPT), and one of the NomPs. Since all these morphemes have to be specified for the feature tone, and since in our analysis, tone on the phonological level is restricted to vowels, we have chosen to represent these morphemes in the dictionary by the following feature matrix: [+Vocalic, +Nasal]. The NEG morpheme and the NomP will also be specified as [-Tone], i.e., low tone, and the OPT morpheme as [+Tone], i.e., high tone. (The NomP is further specified as [+High]--cf. Section 2.51.) A P-rule (P 02) will change the feature [+Vocalic] to [-Vocalic] and also add the feature [+Consonantal]. The P-rule for homorganic nasals will then apply to add the other needed features.

(Alternatively, we could have specified the nasal prefixes as archisegments with the features [+Nasal, +Tone]. It is likely, however, that at an earlier stage these tone-bearing nasals were nasalized vowels, and, at a still earlier stage, syllables consisting of nasal consonants and oral vowels. Since we are positing no underlying nasal consonants we feel there is justification for specifying these morphemes with underlying vowel segments.)

This treatment of the nasal prefixes permits us to specify all grammatical morphemes by SqSC 9. Furthermore, it also permits us to represent all nominal prefixes by an underlying single vowel segment (cf. Section 2.52, SqSC 11).

2.51 Verbal Grammatical Morphemes

The grammatical morphemes which constitute part of the verbal word include the Subject Concord (SC) prefixes, the STative, HABitual, PROgressive, PAST, PERFect, FUTure, OPTative, IMPerative, and CONsecutive aspectual affixes, and the NEGative, INGressive, REDuplicative, and SUBordina-tive morphemes. These are discussed in detail in Chapter 4.

As was stated in Section 2.50, the STA and IMP mor-phemes have no matrix representations in the dictionary. All the other verbal morphemes are either of the shape /V/ or of the shape /CV/. Here, it may be noted that the two INGressive prefixes which have the phonological form /bé/ and /kó/, are derived from the verb roots /bá/ 'come' and /kót/ 'go' respectively. As a verb root, /kót/ conforms to the constraints on primary syllables. As a grammatical morpheme, which is introduced into the surface structure by a transformation, it does not have the final consonant and conforms to the constraints on secondary, or grammatical, syllables.

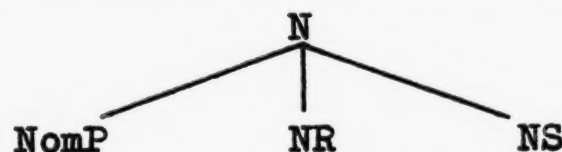
The systematic phonemic forms of the SC prefixes are given in Section 4.20. All of the SCs as listed in the dictionary have redundant low tone, which may be specified by SqSC 10.

SqSC 10:

PC: SC[X $\begin{bmatrix} +\text{Vocalic} \\ -\text{Tone} \end{bmatrix}$ X]

2.52 Nominal Grammatical Morphemes

The nominal word occurs in surface structures under the node N(oun), as shown in the following tree diagram:



where NomP stands for Nominal Prefix, NR for Noun Root, and NS for Nominal Suffix.

Every NR in the lexicon is marked either as [$\pm$ Plural] (if it is the root of a count noun) or [-Plural] (if it is the root of a non-count noun). (By a convention of obligatory specification, whenever the root of a count noun is

selected, either the [+Plural] or the [-Plural] specification of that root must be selected.) Every NR is also marked for the particular NomP or NomPs it selects. Thus the count-noun NR ba /bá/ 'child' is marked as [+3/5]. This means that, if /ba/ is specified as [-Plural] it takes the prefix which we are numbering "3" (i.e., /ò-/), while if it is specified as [+Plural] it takes the prefix which we are numbering "5" (i.e., /N/). Similarly, the non-count-noun NR sika /siké/ 'gold, money' is marked as [+4], which means that it takes the prefix which we are numbering "4": i.e., /ø/.

There are six NomPs, all of which conform to the following Sequence Structure Condition:

SqSC 11: I: [+NomP]
 ↓
 T: [+Vocalic]
 [-Tone]

This condition says that, in their underlying forms, all nominal prefixes are low-tone vowels. (They are also lax, in conformity with SqSC 8.) The distinctive specifications of the six NomPs appear in the lexicon, as follows:

- NomP 1: $\begin{bmatrix} +\text{Low} \\ -\text{Nasal} \end{bmatrix}$ i.e., /à/, as in afe(ε) [àfí(é)] 'year'
- NomP 2: $\begin{bmatrix} -\text{High} \\ -\text{Low} \\ -\text{Back} \end{bmatrix}$ i.e., /è/, as in Ak ena [ènǎ] 'mother'
- NomP 3: $\begin{bmatrix} -\text{High} \\ -\text{Low} \\ +\text{Back} \end{bmatrix}$ i.e., /ò/, as in oba [òbá] 'child'
- NomP 4: $\begin{bmatrix} +\text{High} \\ -\text{Nasal} \end{bmatrix}$ i.e., [ø], as in sika [siké] 'money'
- NomP 5: $\begin{bmatrix} +\text{High} \\ +\text{Nasal} \end{bmatrix}$ i.e., [Ñ], as in mma [m̃má] 'children',
nsa [ñsǎ] 'liquor', nka [ñkǎ] 'scent'
- NomP 6: $\begin{bmatrix} +\text{Low} \\ +\text{Nasal} \end{bmatrix}$ i.e., /ǎ/, (which is changed to /ǎN/ by a P-rule), as in ampan [ǎmpaŋ] 'punting pole', ankaa [ǎŋkáa] 'lemon'

(NomP 6 is rather rare. As Christaller (1875) notes: "The prefix *am* occurs seldom, and appears in some cases as a variation of the prefix 'a'" (p. 22).) These prefixes may be altered by various P-rules. Thus /*à*/, /*é*/, and /*ò*/ may be changed to [*è*] (ultimately [*ə*]), [*è*], and [*ò*] respectively by the tenseness-harmony rule, P 69; in Fante /*é*/ may be changed to /*i*/ (by a P-rule not included in the present phonology), etc.

In some cases, a Noun Root selects different NomPs in different dialects. For example, in the singular the noun root *dan(e)* 'room' takes *ò-* in Akuapem but *é-* in Asante. (The plural is formed with *à-* in both dialects.) Such differences must be indicated in the lexicon. Thus *dan(e)* is marked [+3/1 Ak] and [+2/1 As]. Similarly, the noun root *ponko* 'horse', which forms its plural with *à-* in Akuapem but *ñ-* in Asante (and which forms the singular with *ò-* in both dialects), is marked [+3/1 Ak] and [+3/5 As].

We have not distinguished the NomPs as inherently singular or plural, although some, e.g., *ò-*, are, in fact, always singular. Others, however, such as *à-*, may occur in either singular or plural forms: thus, *abɛ* 'palm nut' (plural *mme*), *abosom* 'guardian spirits' (singular *ɔbosom*). Historically, the singular *à-* and the plural *à-* are very likely derived from distinct prefixes. We have, however, decided to classify the prefixes according to their phonological shape rather than according to their syntactic properties or presumed etymologies.

The Nominal Suffix (NS) is homophonous with the morpheme which, in Chapter 4, we refer to as the VP-final SUBordinative morpheme: i.e., it is a high-tone mid-vowel archiphoneme, which, as a result of the operation of P-rules, has a segmental realization only in Asante, and then only in certain cases. (It is quite likely that the NS and the VP-final SUB are, in fact, the same morpheme, and that the VP-final SUB is simply an occurrence of NS that is transformationally inserted in certain syntactic contexts.) The dialectal differences in the treatment of the NS by the P-rules are illustrated by such forms as Ak-Fa *afe* [*àfí*]/As *afes* [*àfíé*] 'year' and Ak-Fa *ɔhɔhɔ* [*òhóhú*]/As *ɔhɔhɔ* [*òhóhú*] 'stranger'. Since the phonology of the VP-final SUB is discussed in detail in Section 4.81, and since all of this discussion also applies to the NS, the latter will not be discussed any further in the present section.

The personal pronouns of Akan may be said to belong to the lexical category Noun Root, since, like other members of this category, they select particular Nominal Prefixes. (In surface forms the NomPs occur only when the pronouns are used disjunctively: e.g., ɔno? Minhuu no. 'Him? I haven't seen him,' where the NomP ɔ- of ɔno 'him' is present in the disjunctive pronoun but not in the object pronoun.) Their phonology is not accorded any further discussion in this study.

No further discussion is accorded, either, to the phonology of the various other grammatical morphemes--e.g., the interrogative particle /à/ or the conjunction /dã/ (na)--which may occur in surface structures.

Chapter 3

General Phonological Rules

3.10 Introduction.

This chapter is concerned with certain "general" Phonological Rules (P-rules): i.e., P-rules whose application is independent of the syntactic status of the forms serving as inputs to them. Those P-rules, on the other hand, that apply specifically to the finite verb, are discussed in Chapter 4, and those that apply to other specific syntactic categories are, in general, not included in the present study at all. Even within the realm of general phonological phenomena expressible by P-rules, this chapter does not aim at completeness. For example, we have not attempted to deal with the assimilation of vowels to adjacent vowels, or with the epenthetic vowels that may be inserted between adjacent consonants. Nor have we attempted to deal with intonation beyond phrase boundaries.

As was explained in Section 0.50, the function of P-rules is to convert representations of surface structures into systematic-phonetic representations. The representations of surface structures that serve as inputs to the P-rules are in the form of labeled-bracketed strings of morphemes and boundary units, each of which is represented by a matrix in which the columns stand for units (either segmental units or boundary units) and the rows for features. In our description, most of the cells in these matrices will be filled in by a + or a -, representing the feature value assigned to that particular unit. These binary values will either have been present in the dictionary representations of the morphemes, or will have been added by the process of mapping the dictionary matrices onto the Morpheme Structure Conditions (which also are stated in the form of feature matrices). There will be some units in surface structures, however, which are not fully specified as to feature values--cf. Section 2.50.

The P-rules will enter values where needed, change feature values, add and delete both segments and boundary units, etc., and by such operations produce a final string of segments which represent, for the most part, the

equivalent of a traditional phonetic transcription of the sentence generated.

Just as the Morpheme Structure Conditions present a formal set of generalizations about the phonological redundancies of morphemes, so the P-rules express further generalizations about the phonological system. A case in point is the distribution of nasal and oral voiced non-vowels in syllable-initial position. As we have seen (cf. Section 1.30), no nasal non-vowels are postulated at the systematic-phonemic level in Akan. It is, however, true that at the systematic-phonetic level nasal voiced non-vowels do occur, and that in syllable-initial position they are generally in complementary distribution with their oral counterparts, the nasal non-vowels occurring only before nasalized vowels, the oral non-vowels only before oral vowels. The latter generalization is captured by a P-rule which changes the [-Nasal] specification of all voiced non-vowels to [+Nasal] in appropriate contexts. (Exceptions to the generalization, such as dum [dũm?] 'extinguish' or Ak-As mma [mma?] 'doesn't come', are accounted for by the operation of other P-rules.)

A formal statement of all the P-rules with which we deal, both those discussed in this chapter and those discussed in Chapter 4, is given in the Appendix. In this appendix all of the rules will be linearly ordered: i.e., numbered according to the order in which they are to be applied. In the present chapter, no such ordering is attempted, since, in the first place, the rules discussed here are, from the point of view of linear ordering, interspersed among the rules to be discussed in Chapter 4, and since, in the second place, it has seemed to us appropriate, for expository purposes, to discuss all rules relating to such phenomena as nasalization, palatalization, etc., in blocks, regardless of their linear ordering in relation to other rules. For example, some nasalization rules must precede palatalization rules while others must follow them. Furthermore, the ordering of some of these rules is different in different dialects. (It is possible that such ordering differences reflect the way in which changes occurred in time after the speakers of the several dialects had become spatially separated.) While we do mention some of these ordering phenomena in the present chapter, we have not attempted to reflect them in the order in which the rules are discussed.

For the purposes of this chapter, we have adopted an interim numbering of the rules, using lower-case Roman numerals: i.e., P i, P ii, etc. After each such number at the head of a rule will appear a parenthetical notation referring to the number of the rule in the linearly-ordered set to be found in the Appendix. (The numbers of the rules in the Appendix are all two-place Arabic numerals: i.e., P 01, P 02, etc.) In the text of this chapter, however, only the interim (Roman) numbers will be referred to.

3.20 Nasalization.

All published descriptions of Akan phonology before the present one have included nasal consonants as phonological segments. This is true of the description of "morpho-phonemic" segments as well as of "phonemic" segments. Our decision to eliminate nasal consonants as underlying segments is, however, supported by Stewart, who writes (personal communication): "To me it is thoroughly counter-intuitive to recognize nasal consonants at the morphophonemic level in any of the languages of the so-called 'Akan' group.... My only reservation is in the case of the homorganic nasal prefix, which might perhaps be better treated as a vowel." (Interestingly, we had decided independently to represent the homorganic nasal prefixes as nasal vowels--cf. Section 2.50.) It is worth noting, in this connection, that in Baulé, a language closely related to the three dialects we are describing, the nasal consonants occur only as homorganic nasals, or before nasalized vocalic sounds (Stewart, 1956).

In the dialects we are describing, nasal non-vowels occur (at the systematic-phonetic level) in the following environments:

- (1) in syllable-initial position before nasal vowels: e.g., ma [mã] 'give', na [nã] 'and';
- (2) in syllable-final position, both morpheme-medially, before voiceless homorganic consonants: e.g., adanse [adansɪ] 'testimony', kompɔ(w) [kompɔ(w)] 'goiter', and in morpheme-final position: e.g., nam [nãm] 'meat';
- (3) as syllabics, especially before voiceless consonants or nasals: e.g., ntade [ntadɪ] 'clothes', ɲɲo [ɲɲu] 'palm oil'.

As we shall show in the immediately following sections, all these occurrences of nasal non-vowels are predictable if we start with an inventory of systematic phonemes which includes only oral non-vowels but both oral and nasalized vowels.

In most cases, nasalized vowels occurring at the systematic-phonetic level are realizations of [+Vocalic, +Nasal] systematic phonemes. There are, however, some cases in which vowels which are [-Nasal] at the systematic-phonemic level acquire a [+Nasal] specification as the result of the application of P-rules. Such cases are discussed in Section 3.26.

3.21 Regressive Non-Vowel Nasalization.

Syllable-initial nasal non-vowels are in most cases phonetic actualizations of either voiced oral true consonants or oral glides which precede a nasalized vowel. This can be stated as the following P-rule:

P i (P 06):

$$[-\text{Vocalic}] \rightarrow [+Nasal] / \left\{ \begin{array}{l} \overline{[+Consonantal]} \\ [+Voiced] \\ \overline{[-Consonantal]} \end{array} \right\} / \underline{\quad} \begin{array}{l} [+Vocalic] \\ [+Nasal] \end{array}$$

(When two slashes appear on the right of the arrow in a P-rule, features between the two slashes are features of the segments affected by the rule, while features after the second slash are features of segments adjacent to those affected by the rule. Thus the above rule says that a [-Vocalic] segment becomes [+Nasal] if the segment is marked either as [+Consonantal, +Voiced] or as [-Consonantal], and if, further, it immediately precedes a [+Vocalic, +Nasal] segment.)

Some applications of the rule are illustrated below:

<u>Underlying form</u>		<u>After P i</u>
/bã/	'give'	[mã]
/dã/	'and'	[nã]
/jã/	'receive'	[ɲã] (or [jã])
/wãdĩ/	'scrape'	[ɲwãĩ] (or [wãĩ])
/hũ/	'fear'	[hũ]

It is this rule that accounts for the fact that (with certain exceptions attributable to the operation of subsequent P-rules) there are no surface syllables in which a voiced oral true consonant or an oral glide is followed by a nasalized vowel. Voiceless oral true consonants, on the other hand, are not affected by the rule, and thus we find such contrasts as: nsa [nsã] 'liquor' vs. nsa [nsa] 'hand', pam [pãm?] 'confederate' vs. pam [pam?] 'sew', kyi [tçi?] 'squeeze' vs. kyi [tçi?] 'hate', etc.

3.22 Syllable-Final Nasal Consonants.

SqSC 2 (Section 2.20) specifies all syllable-final non-vowels as stop consonants. If these segments are voiced, they are realized phonetically as nasal consonants. SqSC 3 (same section) specifies all morpheme-medial syllable-final consonants as [+Voiced], with the consequence that all such segments are realized phonetically as nasal consonants.

The P-rule for syllable-final nasal consonants can be stated as follows:

P ii (P 03):

[+Voiced] → [+Nasal] / [—Consonantal] =

The following examples illustrate this rule:

	<u>Underlying Form</u>		<u>After P ii</u>
<u>dub</u>	/dub/	'extinguish'	[dum]
<u>ton(o)</u>	/tūd/	'forge'	[tūn]
<u>sen</u>	/seg/	'hang'	[seŋ]
<u>tumpan</u>	/tub=päg/	'bottle'	[tum=pǎŋ]
<u>Asante</u>	/a+sad=ti/	'Asante'	[a+san=ti]
<u>pɔŋkɔ</u>	/pɔg=kɔ/	'horse'	[pɔŋ=kɔ]

(The forms presented in square brackets are not necessarily final phonetic forms, and are used merely to illustrate this step in the derivation.)

There are a number of dialect differences in the ultimate phonetic realization of the final nasal consonants which result from the operation of P ii. For example, in Fante a word-final velar nasal (or a velar nasal followed only by a word-final glottal stop) is always changed to an alveolar nasal. The replacement of velar by alveolar nasals in Fante, however, is not limited to word-final (or pre-glottal-stop) position, but also occurs intervocalically. Furthermore, the intervocalic replacement of velar by alveolar nasals (but not the word-final replacement) occurs in Asante as well. (For a discussion of circumstances under which the intervocalic velar nasals that undergo the change in question are derived, cf. Sections 4.73 and 4.74.) Since it seems advisable to express the replacement of velar by alveolar nasals in a single rule, we shall state the change in question in the following form:

P iii (P 70):

$$[\eta] \rightarrow [n]/v \begin{cases} (+)v \\ (?)_{\#\#} \end{cases} \begin{matrix} : \text{As-Fa} \\ : \text{Fa} \end{matrix}$$

(where the morpheme boundary + is not also a word boundary)

(In dialect-specific rules, the relevant dialects are referred to, as above, to the right of the rule. For examples of the operation of this rule, cf. Section 4.74.)

As is mentioned in Section 4.74, Asante has a rule for vocalizing a word-final velar nasal or a velar nasal followed only by a word-final glottal stop. (In the latter case, the rule also deletes the glottal stop.) The rule may be stated as follows:

P iv (P 71):

[ŋ] <[ʔ]> → $\left[\begin{array}{l} +\text{Vocalic} \\ \alpha\text{Back} \\ \beta\text{Tense} \end{array} \right] <\emptyset> / \left[\begin{array}{l} +\text{Vocalic} \\ \alpha\text{Back} \\ \beta\text{Tense} \end{array} \right] \_\_\_ \#\# : \text{As}$

(Since [ŋ] is [+High,+Nasal], these features carry over to the [+Vocalic] segment which replaces it.) This rule, which replaces word-final [ŋ] in Asante by a nasalized high vowel agreeing in backness and tenseness with the preceding vowel, is responsible for such dialect differences

as those in the final segments of Ak [mãŋ]/As [mãĩ] 'community', Ak [diŋ]/As [diĩ] 'name', Ak [tɔŋ]/As [tɔũ] 'sell', etc. (For an account of the nasalization of the first vowel of As [diĩ] and [tɔũ], cf. Section 3.26.) (In some Asante subdialects, the replacement of word-final [ŋ] by a nasalized vowel is limited to [ŋ]s which follow [-Back] vowels. Such dialects have [mãĩ] and [diĩ], but have [tɔŋ] instead of [tɔũ].)

There are other dialect-specific rules affecting final nasal consonants, such as the rule discussed in Section 4.72 which changes certain final [m]s or [n]s in Verb Roots to [ʔ]s. Such rules, however, are not formulated in the present chapter.

3.23 Nasal Prefixes.

As was noted in Section 2.50, there are three grammatical morphemes which are realized as homorganic-nasal-consonant prefixes. These are the negative morpheme (NEG), the optative morpheme (OPT), and one of the nominal prefixes (NomPs). In dictionary matrices, these morphemes are specified as nasalized-vowel archisegments with low tone in the case of NEG and the NomP, high tone in the case of OPT. (In the case of the NomP the dictionary matrix also specifies the archisegment as [+High].)

There is also one grammatical morpheme, another of the NomPs (cf. Section 2.52), which is realized as a prefix consisting of a low vowel plus a homorganic nasal consonant. In the dictionary matrix, this morpheme is specified as a [+Low,+Nasal] segment (which, like all NomPs is redundantly [+Vocalic,-Tone]): i.e., /ã/.

A P-rule is needed to change the [+Vocalic] specification of the three morphemes realized as homorganic nasals to [-Vocalic,+Consonantal], and to add a [-Vocalic,+Consonantal,+Nasal] segment after the NomP /ã/. This rule, which must precede the rule that makes nasal consonants homorganic with the non-vowel that follows (cf. Section 3.24), may be stated as follows:

P v (P 02):

$$\left[\begin{array}{c} +\text{Vocalic} \\ <+\text{Low}> \end{array} \right] \rightarrow <[\text{ã}]> \left[\begin{array}{c} -\text{Vocalic} \\ +\text{Consonantal} \\ <+\text{Nasal}> \end{array} \right] / + \left[\begin{array}{c} \overline{+\text{Nasal}} \\ +\text{G} \end{array} \right] +$$

(The presence of the two formative boundaries in the environment prevents the rule from applying to the nasalized vowel of such a grammatical morpheme as /bĩ/, the 1st-person-singular Subject Concord prefix. These boundaries ensure that the rule will apply only to single-segment grammatical morphemes.)

Given the surface structure of the sentence Ɔmfa Kofi 'He should take Kofi', which is, roughly:

$S[VP[V[SC[ɔ]_{OPT}[N]_{VR}[fát]]_{NP}[Kòfí]]]$

(where $_{OPT}[N]$ stands for the feature matrix $\left[\begin{array}{l} +Vocalic \\ +Nasal \\ +Tone \\ +G \\ +OPT \end{array} \right]$)

this rule operates to specify the OPT segment as a high-tone nasal consonant. (At this point in the derivation, the other features are not yet specified.) Similarly the rule specifies the NEG morpheme or the homorganic-nasal NomP as a low-tone nasal consonant. In the case of the NomP /ã/, the rule adds a nasal consonant after the vowel.

3.24 Homorganic Nasals.

There are many cases in Akan where, within word boundaries, we find nasal consonants that are homorganic with a following non-vowel. Within morpheme boundaries, the obligatory homorganicness of nasal consonants with following non-vowels is accounted for by SqSC 3 (cf. Section 2.21), and by P ii (cf. Section 3.22). For cases involving the homorganicness of nasals with following non-vowels across morpheme boundaries (but within word boundaries), another rule is needed. Such cases include, among others, words with one of the nasal prefixes discussed in Section 3.23, and, in most dialects, words involving the reduplication of monosyllabic Verb Roots with final nasal consonants, in which the final nasal consonant of the reduplicating syllable is made homorganic with the initial non-vowel of the VR (cf. Section 4.62, subsection (b)). (In the case of reduplicated forms of disyllabic VRs that end in a nasal consonant, the situation is somewhat more complex, although here too the final nasal of the reduplicating prefix is often made homorganic with the initial non-vowel of the VR--cf. Section 4.64.)

The rule for homorganic nasals across morpheme boundaries may be stated as follows:

P vi (P 25):

$$\left[\begin{array}{l} +\text{Consonantal} \\ +\text{Nasal} \end{array} \right] \rightarrow \left[\begin{array}{l} \alpha \text{ Coronal} \\ \beta \text{ Back} \\ \gamma \text{ High} \end{array} \right] / \text{---} + \left[\begin{array}{l} -\text{Vocalic} \\ \alpha \text{ Coronal} \\ \beta \text{ Back} \\ \gamma \text{ High} \end{array} \right]$$

(This statement of the rule does not provide for dialect differences in the treatment of reduplicating prefixes.)

Some examples of the operation of P vi are:

<u>Before P vi</u>		<u>After P vi</u>
[ãN+paŋ]	'punting pole'	[ãm+paŋ]
[Ṇ+baʔ]	'doesn't come'	[ṃ+baʔ]
[Ṇ+da]	'should sleep'	[ṇ+da]
[Ṇ+gú]	'palm oil'	[ŋ̣+gu]
[kũm+kũm]	'kill and kill'	[kũŋ+kũm]

(It should be noted that P vi must follow the palatalization rule, P xviii--cf. Section 3.60. For example, given the underlying form /Ṇ+kég/ 'side' and the surface form Ak [ŋ̣tçéŋ], it must be the case that Pxviii has changed /k/ to [tç] before P vi applies, since the homorganic nasal is the palatal, [ŋ̣], rather than the velar, [ŋ].)

3.25 Progressive Non-Vowel Nasalization.

After the homorganic-nasal rule, P vi, has applied, another rule, which applies in Akuapem, Asante, and some Fante subdialects, nasalizes all voiced non-vowels (within word boundaries) that follow nasal consonants. This rule may be stated:

P vii (P 72)

$$\left[\begin{array}{l} -\text{Vocalic} \\ +\text{Voiced} \end{array} \right] \rightarrow [+Nasal] / X \left[\begin{array}{l} -\text{Vocalic} \\ +\text{Nasal} \end{array} \right] (+) \text{---} : -\text{Fa}^n$$

(where X does not include ##, and where -Faⁿ indicates non-applicability in some Fante subdialects)

The following items illustrate some phonetic contrasts between, on the one hand, Akuapem and Asante, in which application of P vii is obligatory, and on the other, those Fante subdialects (Faⁿ) in which P vii fails to apply:

<u>Ak-As</u>		<u>Faⁿ</u>
[̀m̀máʔ]	'doesn't come'	[̀m̀báʔ]
[̀ǹná]	'days'	[̀ǹdá]
[̀ŋ̀núʔ]	'should pour'	[̀ŋ̀gúʔ]
[̀ŋ̀péʔ]	'doesn't do'	[̀ŋ̀jéʔ]
[̀ŋ̀wúʔ]	'doesn't die'	[̀ŋ̀wúʔ]

As a result of the operation of P vii, Akuapem and Asante (and some Fante subdialects) lack a distinction between oral and nasal voiced non-vowels after nasal consonants within a word. Thus the difference between the initial consonants of affirmative forms of the Verb Roots ba (/ba/ [ba]) 'come' and ma (/bã/ [mã]) 'give' is not found, in these dialects, in negative forms: e.g., Ak-As mma [̀m̀máʔ] 'doesn't come', Ak-As mma [̀m̀mãʔ] 'doesn't give'. There is, however, still a phonetic contrast in such forms: i.e., the contrast between the oral and nasal vowels. For, while it is true that all vowels are nasalized to some degree in the vicinity of nasal consonants, there is nonetheless a clear phonetic difference between vowels whose underlying representations are nasal (or which are explicitly nasalized by P-rules, as discussed in Section 3.26) and vowels which are merely given a slight nasal coloration because of the nasality of adjacent segments.

3.26 Vowel Nasalization.

As was noted in Section 3.20, while most occurrences of nasalized vowels at the systematic-phonetic level correspond to occurrences of such vowels at the systematic-phonemic level, there are cases in which [-Nasal] vowels are made [+Nasal] through the operation of P-rules. We shall discuss two such cases in the present section. In both of these cases, the replacement of the [-Nasal] by the [+Nasal] specification represents an assimilation to an adjacent [+Nasal] segment. In one of the cases, the adjacent segment is a vowel; in the other, it is a consonant.

SqSC 1 (Section 2.21), the MS Condition specifying the shape of the Akan principle syllable, requires that two successive vowels in a syllable agree in nasality, tenseness, and tone. At the phonetic level, however, the requirement of nasality agreement between successive vowels extends beyond the syllable. In fact, whenever it happens that, at some point in a derivation, two successive vowels within a word show different specifications for the feature [Nasal], the [-Nasal] vowel is made [+Nasal] by application of a P-rule. This rule applies regardless of the order in which the [-Nasal] vowel and the [+Nasal] vowel occur. Thus the rule applies when the inherently [-Nasal] past-aspect suffix (cf. Section 4.33) occurs after a Verb Root that ends with a [+Nasal] vowel, and it also applies when an inherently [-Nasal] vowel occurs before a [+Nasal] vowel that has been derived through application of the Asante rule (P iv, Section 3.22) which replaces a final [ŋ] by a nasalized high vowel. An example of the first type is Ak mae [mãf] 'gave', derived from deep structure /bã/ 'give' + /ɪ/ (past-aspect suffix). (For details of the derivation, cf. Section 4.91, subsection (d).) An example of the second type is As [bãf] 'wall', derived from deep-structure [bag] as follows: /bag/ → [baŋ] by P ii; [baŋ] → [baɪ] by P iv; [baɪ] → [bãf] by the P-rule under discussion.

The rule for nasalizing a vowel adjacent to a nasalized vowel may be stated as follows:

P viii (P 73):

$$[+Vocalic] \rightarrow [+Nasal]/(+) \begin{bmatrix} +Vocalic \\ +Nasal \end{bmatrix} (+)$$

(This rule incorporates a notational device suggested by Bach (1968), in which the environment is to be interpreted as either preceding or following the segment affected by the rule. Thus P viii is an abbreviated form of the following:

$$[+Vocalic] \rightarrow [+Nasal]/ \left\{ \begin{array}{l} (+) \begin{bmatrix} +Vocalic \\ +Nasal \end{bmatrix} (+) \_\_\_\_\_\_ \\ \_\_\_\_\_\_ (+) \begin{bmatrix} +Vocalic \\ +Nasal \end{bmatrix} (+) \end{array} \right\} ,$$

To turn now to the nasalization of vowels under the influence of adjacent [+Nasal] consonants, we find that this

is a considerably more restricted phenomenon than is vowel nasalization under the influence of adjacent [+Nasal] vowels. In the first place, it is only [-Nasal] vowels that precede nasal consonants, never those that follow such consonants, that are changed to [+Nasal]. For example, while the vowel of dum [dũm?] (underlying form: /dub/) 'extinguish' is nasalized under the influence of the following [m], the vowel of Ak-As mmu [mmu?] (underlying form: /N+bu/ 'doesn't bend' is not nasalized under the influence of the preceding [m]. Second, the [+Nasal] consonant responsible for the change must be in the same syllable as the vowel: compare Fa [tũn?] and Ak-As [tu=nũ] (underlying form: /tud/) 'forge'. (For details of the derivation of such forms, cf. Sections 4.73 and 4.74.) Finally, it is only high vowels, never mid or low vowels, that are affected. Thus while dum and Ak den [dɛŋ] 'difficult' have nasalized vowels, Ak den [dɛŋ] 'what', Ak dɔn [dɔŋ] 'clock', and dam [dam] 'madness' do not.

The rule for nasalizing high vowels before nasal consonants in the same syllable may be stated as follows:

P ix (P 74):

$$\left[\begin{array}{c} +\text{Vocalic} \\ +\text{High} \end{array} \right] \rightarrow [+Nasal] / \text{---} \left[\begin{array}{c} +\text{Consonantal} \\ +\text{Nasal} \end{array} \right] =$$

It may be noted that, as a result of a combination of the operation of this rule and the progressive non-vowel nasalization rule, P vii, discussed in Section 3.25, certain systematic-phonemic contrasts may be eliminated at the systematic-phonetic level. For example, in Akuapem and Asante (and some Fante subdialects), while affirmative forms involving the Verb Roots dum (/dub/) 'extinguish' and num (/dũb/) 'suck' are (except in the optative) distinct--e.g., odum [odum?] 'he extinguishes' vs. onum [onũm?] 'he sucks'--negative forms involving these VRs are homophones--e.g., Ak-As onnum [onnũm?] 'he doesn't extinguish, he doesn't suck'. This homophony results from the fact that, in negative forms in these dialects, the initial /d/ of dum is nasalized after a nasal prefix by P vii, while the vowel is nasalized by P ix. (In the case of num, the initial /d/ of underlying /dũb/ is nasalized by P i--cf. Section 3.21--and the vowel is inherently [+Nasal].) Such an elimination of contrasts does not occur in negative forms involving such verb roots as gyam (/gab/) 'bemoan' and nyam (/jãb/) 'wave', because, even though the initial

non-vowels of the roots are homophonous in negative forms in these dialects (both being realized as palatal nasals, as the result of the application of different P-rules), the vowel of gyam, not being high, is unaffected by P ix, and hence continues to contrast with the vowel of nyam: compare Ak-As onnyam [ɔpɔmʔ] 'he doesn't bemoan' and onnyam [ɔpɔ̃mʔ] 'he doesn't wave'.

3.30 Final Consonants.

At the systematic-phonemic level, morpheme-final non-vowels are restricted, by SqSC 2 (Section 2.20), to the six stop consonants /p, t, k, b, d, g/, (and syllable-final but morpheme-medial non-vowels are restricted, by SqSC 3 (same section), to the three voiced stop consonants /b, d, g/). We have already, in Section 3.22, discussed P-rules which apply to the voiced final consonants: i.e., P ii, which changes syllable-final /b, d, g/ to [m, n, ŋ] respectively; P iii, which changes word-final [ŋ] to [n] in Fante; and P iv, which changes word-final [ŋ] to a nasalized high vowel in Asante.

The three voiceless stops, /p, t, k/, are changed, in morpheme-final position to [w, r, ?] respectively. Since these latter segments do not constitute a "natural class" within the feature system with which we are working, it would perhaps be simplest not to attempt to formulate the rule for the change of morpheme-final /p, t, k/ to [w, r, ?] entirely in feature terms, but, instead, to state it in some such form as the following:

$$\left[\begin{array}{l} +\text{Consonantal} \\ -\text{Voiced} \end{array} \right] \rightarrow \left\{ \begin{array}{l} [w] / \left[\begin{array}{l} \text{---} \\ -\text{Coronal} \\ -\text{Back} \end{array} \right] \\ [r] / \left[\begin{array}{l} \text{---} \\ +\text{Coronal} \end{array} \right] \\ [?] / \left[\begin{array}{l} \text{---} \\ +\text{Back} \end{array} \right] \end{array} \right\} +$$

(The segment [r] is a liquid--i.e., a [+Vocalic, +Consonantal] segment; this is a segment type not found at the systematic-phonemic level in Akan. The segment [?] is a glide specified as [+Glottal Constriction]; this feature specification

too is not found at the systematic-phonemic level in Akan.) In the interest, however, of possibly shedding some light on the historical development of the final non-vowels in Akan, we may propose the following rather complex rule, which is stated entirely in feature terms, and which covers the changes not only of the voiceless final non-vowels but of the voiced final non-vowels as well (and which, since it replaces rule P ii, is given the interim number P ii¹):

$$\begin{array}{l}
 \text{P ii}^1 \text{ (P 03):} \\
 \left. \begin{array}{l}
 \left. \begin{array}{l}
 [+Consonantal] \rightarrow \left\{ \begin{array}{l}
 \begin{array}{l}
 [+Nasal] \quad / \left[\begin{array}{c} \overline{+Voiced} \end{array} \right] \\
 [+Voiced] \quad / \left[\begin{array}{c} \overline{+Anterior} \\ -Nasal \end{array} \right] \\
 \left[\begin{array}{c} -Consonantal \\ <+Glottal> \end{array} \right] / \left[\begin{array}{c} \overline{-Coronal} \\ <-Anterior> \\ -Nasal \end{array} \right] \\
 [+Vocalic] \quad / \left[\begin{array}{c} \overline{+Coronal} \\ -Nasal \end{array} \right]
 \end{array} \right\} / \text{---} =
 \end{array} \right\}
 \end{array} \right.
 \end{array}
 \begin{array}{l}
 \text{(a)} \\
 \text{(b)} \\
 \text{(c)} \\
 \text{(d)}
 \end{array}
 \end{array}$$

(The four subparts of this rule are "conjunctively ordered": i.e., each subpart of the rule--(a), (b), (c), (d), above--applies in turn if the conditions for its application are met. However, no recycling is permitted. That is, segments that have undergone the change specified in subpart (b) of the rule may, where appropriate, undergo subpart (c) or subpart (d), but may not be resubmitted for the application of subpart (a). Similarly, segments that have undergone the change specified in (c) may not be resubmitted for application of (a) or (b), and those that have undergone the change specified in (d) may not be resubmitted for application of (a), (b), or (c).)

Line (a) of the rule changes the voiced syllable-final consonants /b, d, g/ to [m, n, ŋ] respectively. Line (b) voices the anterior voiceless oral consonants /p/ and /t/, changing them to [b] and [d] respectively. Line (c) changes the non-coronal oral consonants [b] and /k/ to glides, and, in the case of the non-anterior /k/, adds the feature of glottal constriction; thus [b] → [w] and /k/ → [ʔ]. Line (d) changes the coronal oral consonant [d] to the liquid [r]. The operation of this rule may be illustrated as follows:

Underlying Form	'extinguish' /dub/	'forge' /tūd/	'hang' /sɛŋ/	'dance' /sap/	'reach' /dut/	'stand' /sik/
After (a)	[dum]	[tūn]	[sɛŋ]	—	—	—
After (b)	—	—	—	[sab]	[dud]	—
After (c)	—	—	—	[saw]	—	[siʔ]
After (d)	—	—	—	—	[dur]	—
Output of P ii ¹	[dum]	[tūn]	[sɛŋ]	[saw]	[dur]	[siʔ]

3.31 Final [w] → [ʔ].

In Akuapem and, in some Fante subdialects (which we shall refer to as Fa¹), a [w] which is derived from an underlying morpheme-final /p/ (cf. P ii¹, Section 3.30) is normally retained, and occurs in surface forms. In Asante, however, and in some other Fante subdialects (which we shall refer to as Fa²), a [w] in morpheme-final position is replaced by a glottal stop, by means of the following P-rule:

P x (P 29):

[w] → [ʔ] / ___ + :As, Fa²

This rule is responsible for such dialect differences as Ak-Fa¹ [[sawʔ]/As-Fa² [saʔ] 'dance', Ak-Fa¹ [piwʔ]/As-Fa² [piʔ] 'be thick', Ak-Fa¹ [dowʔ]/As-Fa² [dɔʔ] 'cultivate', etc. (For an explanation of the glottal stop that follows the [w] in the Ak-Fa¹ forms cited, cf. Section 4.74, subsection (a).)

3.32 Glottal-Stop Deletion.

There is a general, non-dialect-dependent, P-rule that deletes all glottal stops that are not immediately followed by a pause. The glottal stops deleted by this rule may have had one of a number of different origins.

For example, they may represent reflexes of underlying morpheme-final /k/ (cf. Pii¹, Section 3.30); they may represent reflexes of underlying morpheme-final /p/, which has first been changed to [w] by P ii¹ and then changed to [ʔ] by P x (cf. Section 3.31); or they may have arisen in various other ways discussed in Chapter 4. Regardless of the derivation of the glottal stops, the following rule is obligatory:

P xi (P 04):

[+Glottal Constriction] → ø/___X

(where X is not a [+PB])

This rule is responsible for the absence of the glottal stop after [osi] in [osi ho] 'he stands there' (cf. [osiʔ] 'he stands'), after [ɔɔɔ] in As-Fa² [ɔɔɔ ho] 'he cultivates that place' (cf. As-Fa² [ɔɔɔʔ] 'he cultivates'), etc. (Although P xi occurs early in the linearly-ordered set of P-rules, there is a condition on it to the effect that it reapplies immediately whenever the conditions for its application are met. Hence it applies, for example, to outputs of P x, even though P x occurs at a later point in the linearly-ordered set.)

3.40 Medial Intervocalic Consonants.

Some rules that affect medial intervocalic consonants have already been mentioned: viz., P i (Section 3.21), which nasalizes a voiced syllable-initial consonant that is followed by a nasalized vowel, whether the consonant in question is initial or medial within a morpheme or word; and P iii (Section 3.22), which, in Asante and Fante, changes an intervocalic [ŋ] to [n]. In addition to these rules, which affect certain intervocalic consonants that are followed by nasalized vowels, there are several P-rules that affect intervocalic consonants (within a disyllabic or longer morpheme) that are followed by oral vowels.

When the systematic phoneme /d/ occurs in intervocalic position within a morpheme, it is, as we have seen, changed to [n] if the following vowel is [+Nasal]. If, on the other hand, this vowel is [-Nasal], the /d/ is changed to [r]. Thus systematic-phonemic /fide/ 'call' is realized phonetically as [f(ɪ)rɛ], systematic-phonemic /a+byɔɔ+bs/ 'pineapple' is realized phonetically as [ab(y)rɔɔbs], etc. (For an account of the optional deletion of [ɪ] and [u] in the examples cited, cf. Section 3.75.) This change may be stated in a P-rule as follows:

P xii (P 15):

$$\left[\begin{array}{l} +\text{Consonantal} \\ +\text{Coronal} \\ +\text{Voiced} \end{array} \right] \rightarrow [+Vocalic]/V\_ \left[\begin{array}{l} +\text{Vocalic} \\ -\text{Nasal} \end{array} \right]$$

(Alternatively, since this rule follows P i, we may state it in the following form:

P xii¹:

$$\left[\begin{array}{l} +\text{Consonantal} \\ +\text{Coronal} \\ +\text{Voiced} \\ -\text{Nasal} \end{array} \right] \rightarrow [+Vocalic]/V\_V$$

This formulation presupposes that an underlying /d/ followed by a nasalized vowel has already been specified as [+Nasal]. Thus the only cases in which the condition for P xii¹ are met are those in which the /d/ is followed by an oral vowel.)

P xii (or P xii¹), by changing the underlying [-Vocalic] specification of /d/ to [+Vocalic], replaces /d/ by the liquid [r] in the specified context. This rule, in combination with P i, accounts for the fact that [d] never occurs morpheme-medially in Akan: i.e., it is always replaced either by [n] or by [r], according to whether the following vowel is [+Nasal] or [-Nasal]. (In some subdialects of Asante, there is a set of exceptions to this generalization. These are words in which a morpheme with a medial [d] followed by an oral vowel is followed by a segmental form of the Nominal Suffix (cf. Section 2.52) or of the homophonous Subordinative suffix (cf. Section 4.81). In such words in these Asante subdialects there is alternation between [r] and [d] at the phonetic level. Thus /bidi+NS/ 'witch' may be realized as [birie] or [bidie], and /jadi+SUB/ 'be ill' may be realized as [jarie] or [jadie].)

It should be noted that P xii is a rule restricted to the morpheme, and does not apply across morpheme boundaries. Thus one finds intervocalic [d]s in words such as ɔda [ɔda] 'he sleeps', which consists of the Subject Concord prefix ɔ- plus the verb root da, or Ak-As akade [akāde], in which kade is a compound noun root formed from ka 'smell' and ade 'thing'. In the case of progressive verb forms, however, the initial /d/ of the Progressive

morpheme /di/, is realized phonetically as [r] after a Subject Concord prefix, in spite of the fact that, at the surface-structure level, it is preceded by a morpheme boundary. Thus /ɔ+di+ba/ 'he is coming' is realized phonetically as Ak [ɔriba], not as [ɔdiba]. This suggests the need for a P-rule which eliminates morpheme boundaries ([+FB]s) between Subject Concord prefixes and Aspectual prefixes (of which the Progressive is one). This rule may be stated:

P xiii (P 14):

[+FB] → ∅/[+SC]__[+ASP]

We must assume that P xiii precedes P xii in order to account for the occurrence of [r], rather than [d], as the initial segment of the Progressive morpheme.

When the systematic phoneme /g/ occurs in intervocalic position within a morpheme, it is changed to [ŋ] (by P i) if the following vowel is [+Nasal]. If the following vowel is [-Nasal], and if the medial syllable beginning with /g/ is of the shape CV or CVC (i.e., if it is not of the shape CVV or CVVC), the /g/ is deleted by means of the following rule:

P xiv (P 08):

[g] → ∅/V__V(C)=

This rule operates, for example, to change the underlying forms of the Verb Roots *boa* /buga/ 'help' and /wigek/ 'finish' to [bua] and [wiek] respectively. (Actually, in the case of /wigek/, P iil (Section 3.30), since it precedes P xiv, would already have changed the final /k/ to [ʔ], so P xiv would operate to change [wigeʔ] to [wieʔ]. The final phonetic form of this morpheme is [yieʔ], with the change in the initial segment the result of the palatalization rule, P xviii (Section 3.60).)

Note that, if the /g/ is followed by a sequence of two vowels, it is not deleted. Thus the /g/ of *hodwo(w)* /hoguep/ 'become slack' is not affected by P xiv, and is realized, after the application of various P-rules, as the [dʒu] of [hodʒuɔ(w)]. Similarly, after the /I/-insertion rule, P xix (Section 3.61), has inserted an /i/ after the /g/ of *kagya(w)* /kægəp/ 'wither', with the result that the

/g/ is followed by the vowel sequence [iə], P xiv fails to apply, and the /g/ is realized, after the application of various P-rules, as the [dʒ] of [kədʒə(w)?].

(We have only investigated the application of P xiv in detail in the case of Verb Roots. Noun Roots seem to present a number of exceptions: e.g., bogyɛ [budʒɪ] 'chin', which is, presumably, derived from underlying /bugɪ/.)

Intervocalic consonants other than /d/ and /g/ do not normally undergo P-rules that depend upon the intervocalic position of the consonants (although they may undergo various P-rules, such as nasalization, labialization, and palatalization, which affect certain syllable-initial consonants followed by certain vowels, whether or not the consonants are intervocalic). There is, however, a rule which affects an intervocalic /k/ in a disyllabic Verb Root (but not, for example, in a disyllabic Noun Root), and which operates to replace the /k/ by a [g] (which is ultimately either nasalized by P i or deleted by P xiv). Since this rule is specific to Verb Roots, it is discussed in detail in Chapter 4--cf. Section 4.77, subsection (a).

3.50 Labialization.

Within a morpheme, a syllable-initial non-vowel immediately followed by a [+Round] vowel is always labialized in Akan: i.e., the non-vowel itself always acquires a [+Round] specification. This labialization process may be stated in a P-rule as follows:

P xv (P 09):

[-Vocalic] → [+Round]/=___[+Round]

The [+Round] vowel that causes the labialization may be the only vowel of the syllable, or it may be the first vowel of a two-vowel sequence. (As is specified by SqSC 2, Section 2.21, the first vowel of a two-vowel sequence within a primary syllable is always /U/, and hence obligatorily [+Round].) In the former case--i.e., when the labialized non-vowel is the initial segment of a CU(C) or CO(C) syllable--the rounding of the non-vowel is not always easily discernible. (It is, perhaps, more discernible in Fante than it is in Akuapem or Asante.) However, just as instrumental evidence has shown that there is

labialization of the initial segments of English soon and coat (though less than in swoon and quote), so, we feel confident, would it show that there is labialization of the initial segments of Akan som [swũm?] 'serve' and kɔ [kwɔ?] 'go'. (Except where we are particularly concerned with labialization, we do not, in this text, normally indicate it in phonetic transcriptions of items such as som or kɔ. That is, instead of [swũm?] and [kwɔ?], we would usually transcribe [sũm?] and [kɔ?] respectively.)

When the labialized non-vowel is the initial segment of a CUV(C) syllable, the /U/ which immediately follows the non-vowel is deleted, so that the labialization of the non-vowel is, at the phonetic level, the only sign of the presence of a [+Round] vowel in the underlying structure. The /U/-deletion rule may be stated as follows:

P xvi (P 10):

[U] → ∅ / ____ [+Vocalic]

(That is, any [U] that immediately precedes a vowel is deleted.)

Some examples of the operation of P xv and P xvi (which must apply in that order) are:

	Before P xv	After P xv	After P xvi
<u>sua</u> 'be small'	[sue?]	[swue?]	[swə?]
<u>twe</u> 'antelope'	[kũf]	[kwũf]	[kwɪ]
<u>hwe</u> 'look at'	[hʊɛ]	[hwuɛ]	[hʊɛ]

(In the case of twe and hwe, palatalization later applies, resulting in the final phonetic forms [tɕɪf] and [ɕɪɛ]--cf. Section 3.60.)

It may perhaps seem somewhat curious to postulate underlying CUV(C) syllables in which the first vowel is obligatorily /U/, and to further postulate that this /U/ is obligatorily deleted. Doing so, however, permits us to eliminate labialized non-vowels at the systematic-phonemic level. That is, we can say that labialization of non-vowels occurs only when a [+Round] vowel follows the non-vowel in the underlying form.

3.60 Palatalization.

In all dialects, the [+Back] non-vowels [k, g, w, h, ŋw (or [w])] are palatalized, in syllable-initial position, when they occur immediately before the [+Palatal] vowels /I/ and /E/, and are realized phonetically as [tɕ, dʒ, ɟ, ɕ, ɲɟ (or [ɟ])] respectively. Thus /kɛ/ → [tɕɛ] (kye 'divide'), /ge/ → [dʒe] (gye 'receive'), /wɪ/ → [ɟɪ] (we 'nibble'), /hɪ/ → [ɕɪ] (hye 'border'), and /wɪd/ (after becoming [ŋwɪn] through the application of other P-rules) → [ɲɟɪn] (nwen(e) 'weave'). (The labialized [+Back] non-vowels [kw, gw, hw], which may, as a result of the [U]-deletion rule, P xvi (Section 3.50), occur immediately before [+Palatal] vowels, are also palatalized in all dialects, being realized as [tɕɟ, dʒɟ, ɕɟ] respectively--cf. Section 3.61 for details.) There is one major exception to this generalization: palatalization does not occur if the following syllable (within the same morpheme) begins with /t/ or /s/. Thus /kɛtɛ/ 'mat' is realized phonetically as [kɛtɛ], not [tɕɛtɛ], while /kɛsɪ/ 'big' is realized phonetically as [kɛsɪ], not [tɕɛsɪ].

The non-dialect-dependent palatalization rule may be stated as follows:

P xvii (P 11):

$$\begin{bmatrix} -\text{Vocalic} \\ +\text{Back} \end{bmatrix} \rightarrow [+Palatal] / \left\{ \begin{bmatrix} -\text{Nasal} \end{bmatrix} \right\} / \text{---} \begin{bmatrix} +\text{Vocalic} \\ +\text{Palatal} \end{bmatrix} \text{X}$$

$$\left\{ \begin{bmatrix} +\text{Nasal} \\ +\text{Round} \end{bmatrix} \right\}$$

(where X ≠ (V)(C) = t/s X)

This rule specifies that all [-Nasal] back non-vowels--i.e., [k, g, w, h]--are subject to palatalization in the appropriate context, but that only round [+Nasal] back non-vowels are subject to palatalization. Thus [ŋw] is subject to palatalization, but [h̥] (which arises as a result of the application of P i to an underlying /h̥V/ sequence--cf. Section 3.21) is not. This accounts for the fact that, e.g., underlying /h̥ɪ/ 'where' is realized phonetically as [h̥ɪ], not as [ɕɪ]. (As we shall see in Section 3.61, [hw], which, like [ŋw] is [+Nasal, +Round], is subject to palatalization.)

Fante offers a few apparent exceptions with regard to the palatalization of non-nasalized [h] before

[+Palatal] vowels: e.g., (e)hɛn [(ɪ)hɛn] 'we', hɛn [hɛn] 'ship'. Comparison of these forms with forms that occur in other dialects, however, reveals that the underlying syllable-initial non-vowels in these items are probably /j/ rather than /h/. Thus for 'we' Akuapem has [jɛɲ] and Asante has [jẽĩ]. In the case of 'ship' the situation is somewhat more obscure, since both Akuapem and Asante have initial [ç]: i.e., the palatalized form of [h]. (The Akuapem form is [çɛɲ], the Asante form [çẽĩ].) However, Christaller's Dictionary lists a dialectal form yɛɲ (presumably [jɛɲ]). While, then, the development of the Fante forms in question is not altogether clear, it seems likely that they do not constitute genuine exceptions to the palatalization rule.

In Fante, the palatalization process has been extended so that not only the [+Back] non-vowels, but, in addition, the [-Back] true consonants are palatalized before [+Palatal] vowels. Thus [p, b, f, m, t, d, s, n] are all palatalized in this context in Fante, being realized as [pj, bj, fj, mj, ts, dz, sj, ɲ] respectively. Compare Ak-As [pɛ]/Fa [pjɛ] (pɛ 'seek'), Ak-As [abɛ]/Fa [abjɛ] (abɛ 'palm'), etc. (Except in the case of [ts], [dz], and [ɲ], the effects of palatalization are not easily discernible when the following vowel is /ɪ/. Thus while Fa [tsɪ?] 'feel', Fa [dzɪ] 'take', and Fa [ɲɪ] 'this is' are easily distinguished from their Ak-As counterparts [tɪ?], [dɪ], and [nɪ] respectively, Fa [pjii] 'many' and [bjii] 'some' are not so easily distinguished from their Ak-As counterparts [pii] and [bi] respectively. In this text, except where we are particularly concerned with palatalization, we do not normally indicate it in such items, but instead use, e.g., [pii] and [bi] for the Fante, as well as for the Akuapem-Asante pronunciations.) For Fante, then, the following additional palatalization rule may be proposed:

P xviii (P 75)

$$\left[\begin{array}{c} \text{-Vocalic} \\ \text{+Consonantal} \end{array} \right] \rightarrow \left[\text{+Palatal} \right] / \text{---} \left[\begin{array}{c} \text{+Vocalic} \\ \text{+Palatal} \end{array} \right] : \text{Fa}$$

This rule may be assumed to follow P xvii, and to account for the palatalization of all true consonants not palatalized by that rule. (Note that, since the non-vowels

affected by P xviii are restricted to true consonants--i.e., [-Vocalic,+Consonantal] segments--neither the glide [h] nor the liquid [r] is palatalized by it.)

We have thus far not accounted for the occurrence of [dʒ], the palatalized counterpart of [g], in items such as gya(w) [dʒə(w)?] 'leave', gya [dʒə] 'fire', etc. Our postulated systematic-phonemic forms for these items have initial /gə/: i.e., /gəp/ 'leave', /gə/ 'fire'. Since the low tense vowel /ə/ is [-Palatal], it cannot be the occurrence of this vowel after the /g/ which causes the palatalization. While we might, in seeking to provide an account of such phonetic forms as [dʒə(w)?] and [dʒə?], have postulated /giəp/ and /giə/, instead of /gəp/ and /gə/, as the underlying forms, we have not done so for several reasons. In the first place, such underlying forms would represent unique instances of two-vowel sequences (within the syllable) in which the first vowel is not /U/. That is, there is never any need for positing such underlying syllables as /kiə/, /hriə/, /giə/, etc. Second, and perhaps more important, there is good evidence for positing a rule which inserts [i] before [ə] under several sets of circumstances. A detailed presentation of this evidence is deferred until Section 3.61, since the evidence bears not only upon [dʒə], etc., but also upon the palato-labialized non-vowels [tɕy], [dʒy], and [ɕy], and upon the fronted round vowel [ü]. For the present we shall simply assume that there is a rule which inserts [i] between [g] and [ə], and that this rule precedes P xvii, so that /gə/ → [giə] (by the [I]-insertion rule) → [dʒiə] (by P xvii). This last form is subject to an obligatory /I/-deletion rule (which will also be presented in Section 3.61), such that [dʒiə] → [dʒə].

3.61 Palato-Labialized Non-Vowels and Fronted Round Vowels.

It may happen, as a result of the application of the labialization rule, P xv, and the [U]-deletion rule, P xvi (cf. Section 3.50), that a sequence is derived in which one of the labialized [+Back] non-vowels [kw, gw, hw] is immediately followed by one of the [+Palatal] vowels [I] and [E]. Under such circumstances, the palatalization rule, P xvii (cf. Section 3.60), applies as it does in other cases in which back non-vowels are followed by palatal vowels. Palatalization operates in such cases to change

[kw] to [tɕy], [gw] to [dʒy], and [hw] to [ɕy]. The following are some representative derivations:

	'leopard'	'kernel'	'look at'
Underlying Form	/kui/	/gui/	/hue/
After P xv	[kwui]	[gwui]	[hwue]
After P xvi	[kwi]	[gwi]	[hwe]
After P xvii	[tɕyɿ]	[dʒyɿ]	[ɕyɛ]

The above derivations of palato-labialized non-vowels all involve underlying forms in which [+Back] non-vowels are followed by /UI/ or /UE/ sequences. We also, however, find palato-labialized non-vowels occurring in certain cases where, in the underlying form, a [+Back] non-vowel is followed by one of the sequences /ue/ or /ũẽ/. Such cases show significant dialect differences. Specifically, in Asante, the phonetic realizations of all of the following underlying sequences--/kue/, /kũẽ/, /gue/, /hũẽ/--involve palato-labialized non-vowels, while in Akuapem and Fante, only the phonetic realizations of the underlying sequences /kue/ and /kũẽ/ involve non-vowels of this type. (The phonetic realizations of underlying /gue/ and /hũẽ/ sequences in Akuapem and Fante involve labialized, rather than palato-labialized, non-vowels.) Thus we find [tɕyɛ?] 'cut' (from /kue/) and [tɕyũ] 'scar' (from /kũẽ/) in all three dialects, but where Asante has [dʒyɛ] 'market' (from /gue/) and [ɕyũ] 'scent' (from /hũẽ/), Akuapem and Fante have [gwɛ] and [h̃wẽ] respectively.

To account for such cases, we posit a rule, with appropriate dialectal restrictions, which inserts an [ɪ] (i.e., an [i] or an [ĩ]) between a [U] and a low tense vowel in certain cases. This rule will, e.g., change /kũẽ/ to [kũĩẽ] in all three dialects, and will change /gue/ and /hũẽ/ to [guĩɛ] and [hũĩẽ] respectively in Asante only. (For the subsequent development of forms such as [kũĩẽ], [guĩɛ], and [hũĩẽ], see below.) (Interestingly enough, Christaller (1881) cites *kwia* as the Fante form corresponding to Ak *twa* [tɕyɛ?] 'cut' at the time he was writing. Further, as Stewart (1966a) has pointed out, the Asante forms cited in Koelle's *Polyglotta Africana* (1854) suggest that in the mid-nineteenth century, Asante had something like [gwĩɛ] and [h̃wĩẽ] where it now has [dʒyɛ] and [ɕyũ].)

In Section 3.60, we suggested that forms such as [dʒə] 'fire' resulted from the application of an [I]-insertion rule changing underlying /ge/ to [gie], which, in turn, then became subject to the palatalization rule. Clearly the [I]-insertion rule that is needed to generate [dʒə] can be combined with the [I]-insertion rule needed to generate [tɕyẽ], etc. This rule may be stated as follows:

P xix (P 07):

$$\emptyset \rightarrow [I] / \left\{ \begin{array}{l} [g] \\ \left\{ \begin{array}{l} [+Back] \\ [k] \end{array} \right\} [+Vocalic] \end{array} \right\} \left[\begin{array}{l} +Vocalic \\ +Low \\ +Tense \end{array} \right] \quad \begin{array}{l} :As \\ :Ak-Fa \end{array}$$

The rule says that [I] is inserted between [g] and a low tense vowel in all dialects. It says, further, that in Asante [I] is inserted between [k/g/hũ] and a low tense vowel ([kũ], [gu], and [hũ] are the only sequences of [+Back] and [+Vocalic] segments that occur immediately before low tense vowels), and that in Akuapem and Fante [I] is inserted between [ku] and a low tense vowel.

After P xix has applied, the labialization rule (P xv), the [U]-deletion rule (P xvi), and the palatalization rule (P xvii), apply in that order. Then another rule is necessary in order to delete the [I]s that were introduced by P xix. This rule may be stated:

P xx (P 13):

$$[I] \rightarrow \emptyset / \_\_ [+Vocalic]$$

(That is, any [I] that immediately precedes a vowel is deleted.)

The derivations of twa [tɕyẽ] 'scar', Ak-Fa gua [gwe]/As dwa [dʒyẽ] 'market', and Ak-Fa hua [hũwẽ]/As hwa [ɕyẽ] 'scent' may now be illustrated:

	'scar'	'market'		'scent'	
Underlying Form	/kũẽ/	/guẽ/		/hũẽ/	
		<u>Ak-Fa</u>	<u>As</u>	<u>Ak-Fa</u>	<u>As</u>
After P xix	[kũĩẽ]	([guẽ])	[guĩẽ]	([hũĩẽ])	[hũĩẽ]
After P xv	[kwũĩẽ]	[gwuẽ]	[gwuĩẽ]	[hwũĩẽ]	[hwũĩẽ]
After P xvi	[kwĩẽ]	[gwẽ]	[gwĩẽ]	[hwẽ]	[hwĩẽ]
After P xvii	[tɕyĩẽ]		[dɕyĩẽ]		[ɕyĩẽ]
After P xx	[tɕyẽ]		[dɕyẽ]		[ɕyẽ]

Related to the phenomena we have been discussing is the phenomenon of the replacement of an underlying /u/ (or /ũ/) by the fronted round vowel [ü] (or [ũ]) before an /ə/ (or /ẽ/) at the beginning of the next syllable. (The sequence [u=ə] arises normally from the deletion of a medial /g/--cf. P xiv, Section 3.40.) This phenomenon shows a certain amount of dialectal and subdialectal variation. For example, in Akuapem the change of [ũ=ə] to [ü=ə] is most common after a [+Coronal] consonant (i.e., [t, d, n, s]), while in Asante it is equally common after other segment types. Thus in both Akuapem and Asante we find forms such as tua [tüé] 'stick', dua [düé] 'plant', nua [nüé] 'sibling', and sua [süé] 'study', but forms such as [küé] for kua 'doll', [büé] for bua 'close', etc. are more common in Asante than in Akuapem (which would usually have [kùé], [bùé], etc.) (We have not been able to investigate the distribution of [ü=ə] sequence in Fante in any detail.)

It seems reasonable to derive the [ü=ə] sequence (and the [ũ=ẽ] sequence) in some such way as the following: [u=ə] → [u=ie] → [ü=ie] → [ü=ə]. That is, we would propose that [i] is inserted before an [ə] preceded by [ũ=], just as it is inserted before an [ə] preceded by a sequence consisting of a [+Back] non-vowel plus [u] within a single syllable. Thereafter the syllable-final [ü] is fronted under the influence of the [i] (a process analogous to palatalization of [+Back] non-vowels before [i]), and, finally, the [i] is deleted, just as it is between the palato-labialized non-vowels and [ẽ].

In order to extend [I]-insertion so as to cover both the cases we have just been discussing and the cases discussed earlier in this section, we may rewrite P xix as follows:

P xix¹ (P 07):

$$\emptyset \rightarrow [I] / \left\{ \begin{array}{l} [g] \\ \left[\begin{array}{l} +Vocalic \\ +Back \\ +High \end{array} \right] = \\ \left\{ \begin{array}{l} [+Back] \\ [k] \end{array} \right\} [+Vocalic] \end{array} \right\} \text{---} \left[\begin{array}{l} +Vocalic \\ +Low \\ +Tense \end{array} \right] \begin{array}{l} : \text{As} \\ : \text{Ak-Fa} \end{array}$$

(This statement of the rule is very general as far as the insertion of [I] after [u̥] is concerned, since it does not allow for dialect differences dependent upon the non-vowel that precedes the [u̥]. We have also not attempted to account for the sporadic occurrence of fronted round vowels in other contexts--e.g., Ak noa [nũã] ~ [nũạ̃] 'cook', Ak-As pue [püé] ~ [püẹ́] 'appear'--which also presuppose application of an [I]-insertion rule.)

As for the rule that changes [u̥] to [ũ] before [=i̥], this may be stated:

P xxi (P 12):

$$[+Segment] \rightarrow \left[\begin{array}{l} -Back \\ +Round \end{array} \right] / \text{---} = [i̥]$$

(The rule need not refer any more specifically to [u̥], since [u̥] is the only segment that occurs in the context in question.)

There is no need to alter the [I]-deletion rule (P xx, above), since it is already stated so as to delete any [I] immediately followed by a vowel, and so will apply to an [I] that has been inserted after [u̥] just as it applies to an [I] that has been inserted in the other contexts specified in P xix¹.

We may illustrate the derivation of the fronted round vowels as follows:

	'stick'	'plant'	'study'
Underlying form	/tù=gé/	/dù=gé/	/sù=gé/
Before P xix ¹	[tù=é]	[dù=é]	[sù=é]
After P xix ¹	[tù=ié]	[dù=ié]	[sù=ié]
After P xxi	[tù=ié]	[dù=ié]	[sù=ié]
After P xx	[tù=é]	[dù=é]	[sù=é]

3.70 Vowel Rules.

There are a number of P-rules, some general, some dialect-specific, which operate upon [+Vocalic, -Consonantal] segments in certain contexts to change their phonetic quality. We have already discussed three such rules: i.e., P viii and P ix (Section 3.26), which nasalize vowels in the vicinity of [+Nasal] vowels and consonants, and P xxi (Section 3.61), which changes [u] to [ü] in the context [=i'ə]. There are other rules which add or delete vowels in certain contexts. The rules of this type which we have already discussed are: the [U]-deletion rule, P xvi (Section 3.50), and the [I]-insertion and [I]-deletion rules, P xix¹ and P xx respectively (Section 3.61).

In addition to the rules we have already discussed, there are a number of others that pertain to vowels. These rules are discussed in the immediately following sections.

3.71 Vowel Tensing.

SqSC 5, in Section 2.30, specifies that the vowels occurring within a single morpheme are either all tense or all lax. As was pointed out in that section, however, vowel tenseness harmony in Akan is not limited to the morpheme, but manifests itself to some extent both across morpheme boundaries and across word boundaries.

Vowels occurring in grammatical morphemes, whether the morpheme is a prefix or a suffix, are all inherently lax, as is specified by SqSC 9 (Section 2.50). But when the first (or only) vowel of the first root syllable that follows a grammatical prefix is a non-low tense vowel, the vowel of the prefix is normally realized as phonetically tense. Similarly, when the last (or only) vowel of a root syllable that immediately precedes a grammatical suffix is

a non-low tense vowel, the vowel of the suffix is normally realized as phonetically tense. For example, given a verb formed with the VR /fiti/ 'enter, prick' (of which the first and last syllables both have non-low tense vowels), any affixes included in the verb normally have tense vowels. Thus the verb Ak-As okofitii 'he went and entered', which, in the surface structure, consists of the subject-concord prefix /ɔ/, the ingressive prefix /kɔ/, the VR /fiti/ and the past suffix /ɪ/, is realized phonetically as [okofitii].

It should be noted that it is only the non-low tense vowels in root syllables that tense a preceding or following vowel in a grammatical morpheme. Thus prefix vowels of verbs formed with a VR such as /kəri/ 'weigh', in which the first vowel is tense but low, do not become phonetically tense: e.g., Ak ɔreɓəkəri [ɔrɪɓəkəri] 'he is coming to weigh'. (For the change of /ə/ to [ɪ], see below.) Similarly, a suffix vowel of a verb formed with a VR such as /biɓe/ 'ask', in which the last vowel is tense but low, do not become phonetically tense: e.g., Ak obisae [obɪsɪ] 'he asked'.

Apparent exceptions to the claim that it is only non-low tense vowels that tense preceding vowels in grammatical morphemes are provided by words such as Ak-Fa obegua [obegwɛ?]/As obedwa [obedjɛ?] 'he comes to skin', okogyam [okodjəm?] 'he goes to condole', etc. However, if we investigate the derivation of the root morphemes in such words, we find that, at some point in the derivation, there is always a [u] or [i]--i.e., a non-low tense vowel--before the low tense [ə] that occurs as the first vowel in the final phonetic form. Thus the underlying form of the root Ak-Fa [gwe?]/As [djɛ?] is /guək/, and the [u] of the root is present in the derivation until it is deleted by the [U]-deletion rule, P xvi (Section 3.50). In the case of the root [djəm?], while the underlying form is /gəb/, the [I]-insertion rule, P xix¹ (Section 3.61), obligatorily inserts an [i] between the [g] and the [ə], and this [i] remains present in the derivation until it is deleted by P xx (Section 3.61).

In order to account for these apparent exceptions, then, it would seem to be necessary only to see to it that the rule responsible for tensing the prefix vowels precedes the [U]-deletion and [I]-deletion rules (and follows the [I]-insertion rule).

Such a solution, however, is not in fact possible, given the constraints of the model with which we are working. This is because the model requires that the P-rules operate cyclically (cf. Section 0.50). That is, the entire cycle of applicable P-rules must apply first to the "innermost" constituents of an utterance--i.e., the morphemes--before any rules are applied to larger constituents, such as words. Since the vowel-tensing rule applies across morpheme boundaries, it is clear that the [U]-deletion and [I]-deletion rules, which operate within the morpheme, must be applied before it. Thus, even if the vowel-tensing rule were placed earlier in the cycle of P-rules than the [U]-deletion and [I]-deletion rules, it would simply be inapplicable at the morpheme level, and, before it became applicable at the word level, the morpheme-level vowel-deletion rules would inevitably have applied.

We shall not attempt to solve this problem here, but shall, instead, merely note it, and acknowledge that our rules as presently formulated do not give a fully adequate account of the phenomena in question.

The rule for vowel tensing within the word may be stated as follows:

P xxii (P 69):

$$\left[\begin{array}{c} +\text{Vocalic} \\ +\text{G} \end{array} \right] \rightarrow [+Tense] / \text{---} X \left[\begin{array}{c} +\text{Vocalic} \\ -\text{Low} \\ +\text{Tense} \\ -\text{G} \end{array} \right] Y \text{---}$$

(where: (a) X and Y do not include ##; (b) if the affected segment precedes X, X does not include a [+Vocalic, -G] segment; (c) if the affected segment follows Y, Y does not include a [+Vocalic, -G] segment)

(In the above statement of P xxii, the representation of the context in which the rule applies: i.e.,

$$\text{---} X \left[\begin{array}{c} +\text{Vocalic} \\ +\text{Tense} \\ -\text{Low} \\ -\text{G} \end{array} \right] Y \text{---}$$

is an abbreviation for the two contexts: $\text{---} X [+Vocalic, \text{etc.}]$ and $[+Vocalic, \text{etc.}] Y \text{---}$.)

Unlike vowel tensing within the word, vowel tensing across word boundaries (including the internal word boundaries of compound words--cf. Section 2.30) is strictly regressive: that is, a lax vowel in the last syllable of a word is made tense when the first vowel of the following word is marked [-Low,+Tense,-G], but a lax vowel in the first syllable of a word is not made tense when the last vowel of the preceding word is so marked. Thus in the sentence Ak Kwame fiti ne nsa [kwaamĩ fiti nĩ nsa] 'Kwame pricks his hand', the underlying final /ĩ/ of Kwame is made tense before fiti [fiti], but the underlying /ĩ/ of ne 'his' is not made tense after fiti.

Vowel tensing across word boundaries also differs from vowel tensing within the word in that only one syllable (i.e., the last syllable of the word before the [+Tense] root) is affected. Thus, while in Ak wakofiti [wækofiti] 'he has gone and pricked', all of the prefix vowels have been tensed under the influence of the first vowel of the root [fiti], in Ak Kwame fiti... [kwaamĩ fiti], only the last vowel of Kwame has been tensed. (According to our observations, it seems to be the case that a word-final non-vowel prevents the tensing of a preceding vowel. Thus Ak ɔpon fiti 'Opong pricks...' is realized phonetically as [ɔpon fiti] rather than as [ɔpon fiti]. In our formulation of the rule for vowel tensing across word boundaries, we shall assume that this "protection" of a lax vowel by a following non-vowel is general.)

The rule for vowel tensing across word boundaries may be stated as follows:

P xxiii (P 83):

$$\begin{bmatrix} +\text{Vocalic} \\ -\text{Tense} \end{bmatrix} \rightarrow [+Tense] / \_\_\_\_\_\# \begin{bmatrix} +\text{Vocalic} \\ -\text{Low} \\ +\text{Tense} \\ -\text{G} \end{bmatrix}$$

As the rule specifies, the vowel responsible for tensing across word boundaries must, like the vowel responsible for tensing within word boundaries, be [-Low]. Thus the final [ĩ] of Kwame is not tensed before the [+Low,+Tense] vowel of the first syllable of, e.g., Ak kari [kəri] 'weigh' in Ak Kwame kari [kwaamĩ kəri] 'Kwame weighs (it)'. Furthermore (again as in the case of vowel tensing within word boundaries), the vowel responsible for tensing must be the

first vowel of a root morpheme: i.e., a morpheme marked with the feature [-G] (cf. Section 2.50). Thus the final vowel of Kwame is not tensed in Ak Kwame refiti [kwaamf rifiti] 'Kwame is pricking it', since re [ri] is a grammatical morpheme (with an inherently lax vowel that has been tensed by P xxiv).

As in the case of P xxii, there are apparent exceptions to the claim that it is only non-low tense vowels that are responsible for tensing preceding vowels: e.g., Ak-Fa Kwame gua [kwaamĩ gwe?]/As Kwame dwa [kwaamĩ dʒwe?] 'Kwame skins it', Kwame gyan [kwaamĩ dʒem?] 'Kwame condolees', etc. In this case too, the problem posed by these apparent exceptions is not resolved merely by pointing out (as is true) that at some point in the derivation of roots like Ak-Fa [gwe?]/As [dʒwe?] or like [dʒem?] a [u] and/or [i] precedes the [ə], since, given the cyclic ordering of the P-rules, the [u] and/or [i] will have been deleted at the morpheme cycle before P xxiii applies at the phrase cycle. Once more, we shall simply leave the problem unresolved.

We have not yet dealt with the question of the phonetic realization of, e.g., the first vowel of Ak-As [kari] 'weigh' (from /kəri/). It is in fact the case that, in Akuapem and Asante, whenever a [+Tense, +Low] vowel is followed by a [+Tense] vowel in the next syllable, the [+Tense, +Low] vowel is normally realized phonetically as [ə] (or [ẽ]), rather than [ə] (or [ẽ]). This is so whether the [+Low] vowel is inherently [+Tense] or has acquired its [+Tense] specification as a result of the application of P xxii or P xxiii. Thus in Ak-As afi [əfi?] 'has left', the perfect-aspect prefix a- /a/, which has been made tense through the operation of P xxiv, is realized as [ə]. Similarly in Ak-As ɔba fi [ɔbə fi] 'a child leaves', the vowel of ba /ba/ 'child', which has been made tense through the operation of P xxv, is realized as [ə].

We have also not yet dealt with the fact that, in those contexts in which Akuapem and Asante have [ẽ], Fante has [ẽ]: e.g., Fa [keri]/Ak-As [kari], Fa [efi?]/Ak-As [əfi?], Fa [ɔbe fi?]/Ak-As [ɔbə fi?]. To deal with these phenomena, the following low-level P-rule may be proposed:

P xxvi (P 84):

$$\left[\begin{array}{l} +\text{Vocalic} \\ +\text{Low} \\ +\text{Tense} \end{array} \right] \rightarrow \left\{ \begin{array}{l} [+ \text{Coronal}] \\ [- \text{Low}] \end{array} \right\} / \text{---}(\text{C}) = \text{C} \left[\begin{array}{l} +\text{Vocalic} \\ +\text{Tense} \end{array} \right] \begin{array}{l} : \text{Ak-As} \\ : \text{Fa} \end{array}$$

P xxvi operates to replace [ə] by [a] (which is identified as a [+Coronal] low tense vowel, as opposed to the [-Coronal] low tense vowel [e]) in Akuapem and Asante, and to replace [ə] by the [-Low] vowel [e] in Fante.

3.72 Vowel Backing.

The non-low front vowels ([I] and [E]) are frequently replaced by their back-vowel counterparts ([U] and [O] respectively) when preceded by a [+Round] non-vowel in a checked syllable (i.e., a syllable with a final non-vowel). This process shows considerable dialectal and subdialectal variation. Thus, while the replacement of [I] by [U] in the context in question is found in some items in all dialects (e.g., Ak-As [dʒu̯ma]/Fa [dʒu̯mba] 'business', from underlying /guib+ba/, which has been changed to [dʒu̯m(b)a] by other P-rules), there are other items in which the replacement is dialectally restricted. Thus Akuapem has [ɥwʔ] where Asante has [ɥɪʔ] for 'dry up' (from underlying /wɪp/, which has been changed to Ak [ɥɪwʔ]/As [ɥɪʔ] by other P-rules). On the other hand Asante normally has [ɥu̯nʊ] where Akuapem has [ɥu̯ɪnɪ] for 'weave' (from underlying [wɪd], which has been changed to [ɥu̯ɪn] by other P-rules, and later acquires a final vowel by still another P-rule--cf. Section 4.73). Similarly, while all three dialects have [dʒu̯ŋku] 'hip' (from underlying /gueg=ku/, which has been changed to [dʒu̯ŋku] by other P-rules), the replacement of [E] by [O] in the context in question is more widespread in Fante than it is in the other two dialects. Thus, where Fante has [tɕu̯ŋʔ], Akuapem and Asante have [tɕu̯ŋʔ] and [tɕu̯ɛɪ] respectively for 'wait' (from underlying /kueg/, which is changed to [tɕu̯ŋ] in all dialects before undergoing certain dialect-specific rules responsible for the dialect differences in the final phonetic forms).

The changes we have been discussing may be stated in a rule of the following form:

P xxv (P 76):

$$\begin{bmatrix} +\text{Vocalic} \\ -\text{Back} \\ -\text{Low} \end{bmatrix} \rightarrow [+Back] / \begin{bmatrix} -\text{Vocalic} \\ +\text{Round} \end{bmatrix} \text{---} [-\text{Vocalic}] =$$

(It is not necessary to specify that the vowels affected by P xxii become [+Round] as well as [+Back], since, by the convention established in Section 0.51, the Segment Structure condition that requires that vowels show the same value for the features [Back] and [Round] (SgSC 20, Section 1.24) will automatically apply to [+Back] vowels derived by means of P xxii, specifying them as redundantly [+Round].)

This statement of the rule is a general one, and does not impose any dialectal restrictions on the replacement of [I] by [U] or [E] by [O] in the context in question. Such restrictions may be handled by diacritic features on individual lexical items (cf. Section 0.60), marking the items as subject to, or exempt from, application of the rule in the appropriate instances in the several dialects.

In Fante, the non-low front vowels are also replaced by their back-vowel counterparts before a morpheme-final [w] (in those subdialects in which morpheme-final [w] is retained--cf. Section 3.31), regardless of whether the preceding non-vowel is [+Round]. Compare Fa [tɕɔw] and Ak [tɕɛw]/As [tɕɛ] 'hat' (from underlying /kɛp/), Fa [tsuw?] and Ak [tiw?]/As [ti?] 'pick' (from underlying /tip/). The following rule, specific to Fante, may therefore be proposed:

P xxvi (P 77):

$$\begin{bmatrix} +\text{Vocalic} \\ -\text{Back} \\ -\text{Low} \end{bmatrix} \rightarrow [+Back] / \text{---} [+Round] + : \text{Fa}$$

3.73 Fante Backness Harmony.

In addition to the various instances of the replacement of non-low front vowels by their back-vowel counterparts discussed in Section 3.72, Fante shows such a replacement in certain cases in which an underlying non-low front vowel occurs in a grammatical morpheme that is followed by a root whose first (or only) vowel is [+Back]. This

"backness harmony" (or "roundness harmony") is similar to the "tenseness harmony" described in Section 3.71, except that the range of morphemes affected by the change is considerably smaller. Specifically, a [+High] front vowel (i.e., [I]) occurring in a subject-concord prefix or a possessive pronoun is changed to its [+Back] (and redundantly [+Round]) counterpart (i.e., [U]) in the context in question, and a [-Low] front vowel (i.e., [I] or [E]) occurring in an aspectual or an ingressive prefix is changed to its [+Back] counterpart (i.e., [U] or [O]). (It should be noted that the change of [E] to [O] is not found in subject-concord prefixes and possessive pronouns. Thus Fante, like Akuapem and Asante, has yɛbɔ [jɛbɔ] 'we break' rather than [jɔbɔ], and it has hɛn pɔn [hɛn pɔn] 'our table' rather than [hɔn pɔn]--cf. Ak [jɛŋ pɔŋ]/As [jɛɪ pɔɪ].)

Illustrations of the effects of backness harmony in Fante are provided by the following phonetic contrasts between, on the one hand, Fante, and on the other, Akuapem and Asante:

<u>Underlying Form</u>		<u>Fante Form</u>	<u>Akuapem-Asante Form</u>
/bɪ+di+bɔ/	'I am breaking'	[mūrubɔ]	[mɪ(r)ɪbɔ]
/bɪ+be+bɔ/	'I come to break'	[mūbɔbɔ]	[mɪbeɔbɔ]
/jɛ+be+bɔ/	'we shall break'	[jɛbɔbɔ]	[jɛbeɔbɔ]
/dɪ##bu/	'his chest'	[nū bu]	[nɪ bu]

In the case of the ingressive prefix /kɔ/ (cf. Section 4.50), Fante shows a process which is the reverse of the process just illustrated. That is, the non-low back vowel [O] is replaced by its [-Back] (and redundantly [-Round]) counterpart [E] when it precedes a root whose first (or only) vowel is [-Back]. Thus from underlying /bɪ+kɔ+jɛ/ 'I go to do', Fante derives [mɪkɛjɛ] (cf. Ak-As [mɪkɔjɛ]). Through the use of alpha notation, the fronting of the vowel of /kɔ/ can be combined with the backing of the vowels of /bɪ/, /dɪ/, /be/, etc. into a single rule, as follows:

P xxvii (P 78)

$$\left[\begin{array}{l} +\text{Vocalic} \\ \alpha\text{Back} \\ -\text{Low} \\ +\text{G} \end{array} \right] \rightarrow [-\alpha\text{Back}]/\_\_\_\text{X} \left[\begin{array}{l} +\text{Vocalic} \\ -\alpha\text{Back} \\ -\text{G} \end{array} \right] : \text{Fa}$$

(where X does not include a [+Vocalic, -G] segment)

Given this formulation, segments which are exempt from the operation of the rule, such as the [s] of the subject-concord prefix [js] 'we', must be marked with a diacritic feature indicating this fact (cf. Section 0.60).

3.74 Vowel Deletion and Addition.

There are a number of contexts in which P-rules delete or add vowels. Certain of these P-rules are dependent upon the occurrence of particular morphemes or morpheme classes and/or show dialect differences in their application. (Those of such rules that are specific to constituents of the finite verb are discussed in Chapter 4.) There is, however, one very general vowel-deletion rule that may be mentioned here. This is a rule which deletes a [+High] vowel in a CV syllable when this vowel is immediately followed by a syllable with an initial [r]. This rule may be stated:

P xxviii (P 80):

$$\begin{bmatrix} +\text{Vocalic} \\ +\text{High} \end{bmatrix} \rightarrow \emptyset / C \_\_ = r$$

The rule is responsible for such changes as the following: [birɪ] → [bri] 'reddeɪn', [biri] → [bri] 'blacken', [buru] → [bru] 'beat', [buru(w)?] → [bru(w)?] 'demolish', [birs] → [brɛ] 'bring', [bira] → [bra] 'come (imperative)'.

3.80 Systematic-Phonetic Segments.

Application of the P-rules mentioned in preceding sections of this chapter to the set of Akan systematic phonemes (cf. Table 1, Section 1.10) results in a set of systematic-phonetic segments which are approximate representations of the sounds that occur in Akan utterances. Table 7 shows the cover symbols that we use for the systematic-phonetic non-vowel segments:

Underlying Segment	j	h	w	p	b	f	k	g	t	d	s
Nasalized	ɲ	h̃	ɲw		m			ŋ		n	
As Final Consonant				w	m		ʔ	ŋ	r	n	
Labialized	ɥ	hw		pw	bw	fw	kw	gw	tw	dw	sw
Labialized and Nasalized		h̃w			mw			ŋw		nw	
Palatalized	ç	ɥ		pj	bj	fj	tç	dj	ts	dz	sj
Palatalized and Nasalized			ɲɥ		mj			ɲ		ɲ	
Palatalized and Labialized	çɥ						tçɥ	djɥ			
V__V										r	

TABLE 7

SYSTEMATIC-PHONETIC NON-VOWEL SEGMENTS

The inventory of cover symbols for systematic-phonetic vowel segments includes, in addition to the symbols used in Table 1, the symbols [ü] and [ũ] for the fronted round vowels that result from the application of P xxi (cf. Section 3.61) and the symbols [æ] and [ã] for the [+Coronal] low tense vowels that result from the application of P xxiv (cf. Section 3.71). (At some points in the text the symbols [j, w, ŋ] are used as equivalents of [ɲ, ɲw, ɲɥ] respectively.)

3.90 Tone Rules.

At the systematic-phonemic level, all Akan vowels are marked for one of two contrasting tones, low (which we represent as [-Tone] and transcribe with a grave accent) and high (which we represent as [+Tone] and transcribe with an acute accent). At the phonetic level, however, even within a single phrase uttered by a single speaker, these two contrasting tones may be manifested by a number of different pitch levels. Thus the pitch levels of Ak òbékó Kùmásé ánpá yí 'He will go to Kumase this morning' are approximately as is indicated below:

[- - - - - - -]
 ò b é k ó K ù m á s é á n ò p á y í

Furthermore, at the phonetic level, we may find three-way pitch contrasts, such as:

Ak mébó [ˉˉ] 'I will strike'

Ak mé bò [ˉ-] 'my stone'

Ak mé bò [ˉ_] 'my chest'

(The vertical accent in the second example is used to transcribe the phonetic "mid" or "drop" tone--cf. Section 3.92.)

The immediately following sections discuss the general P-rules that are relevant to the phonetic manifestations of tone in Akan. (There are, in addition, many P-rules that affect the tones of particular types of morphemes or morpheme sequences. Those P-rules that bear particularly upon the tones of verbs are discussed in Chapter 4, especially in Sections 4.90 ff.)

3.91 Downdrift.

In many so-called "level" tone languages, the pitches that manifest different occurrences of a particular contrastive tone--say high or low--within a phrase are more or less constant. In many others, however, this is not the case. In Akan, for example, a contrastively low tone at the beginning of a phrase may be manifested by a pitch that is as high as, or higher than, the pitch that manifests a contrastively high tone toward the end of the phrase (cf. the graphic representation in Section 3.90 of the pitches of Ak Obékó Kùmasé ánpá yí, in which the pitches of the first and last syllables are approximately the same, although the first syllable is [-Tone] and the last [+Tone]). This variation in the phonetic pitch associated with different occurrences of a particular contrastive tone within a phrase is accounted for by a rule of "downdrift", which specifies that the pitch interval between a low tone and a following high tone is always less than that between a high tone and a following low tone. Thus, given a sequence of tones LHL (where L = low, H = high), the downdrift rule specifies that the pitch of the second L is lower than that of the first, since the pitch rise from the first L to the H is smaller than the pitch drop from the H to the second L. Similarly, given a sequence of tones HLH, the downdrift

rule specifies that the pitch of the second H is lower than that of the first, since the pitch drop from the first H to the L is greater than the pitch rise from the L to the second H. To illustrate these points graphically:

LHL = [- - -]

HLH = [- - -]

The downdrift rule does not affect the pitches of sequences of Ls in immediate succession or of sequences of Hs in immediate succession. In such sequences the pitch level of the first L or H is more or less maintained throughout the sequence. For example:

LLLHHH = [- - - - -]

HLLLHH = [- - - - -]

All of the phenomena associated with downdrift may be captured in a three-part rule whose parts are conjunctively ordered. (That is, any applicable parts of the rule are applied in order, and if, after all applicable parts of the rule have applied once, the resultant string meets the conditions for some part or parts of the rule, these parts are once more applied in order, and so on, until the string no longer meets the conditions for application of any part of the rule.) The first part of the rule adds a number representing a relative pitch level ("Pitch n") to the first tone-bearing segment or "a-tone segment sequence" that follows a phrase boundary. (By an "a-tone segment sequence" we mean a sequence of identically-valued tone-bearing segments separated only by non-tone-bearing segments.) The second part of the rule applies to a [+Tone] (high tone) segment or segment sequence that follows a [-Tone] (low tone) segment to which a relative pitch has already been assigned. This part of the rule assigns to the [+Tone] segment or sequence a number that represents a relative pitch two steps higher than that of the preceding [-Tone] segment. (If the pitch of the preceding [-Tone] segment is "Pitch n", that of the [+Tone] segment or sequence is "Pitch n+2".) The third part of the rule applies to a [-Tone] segment or sequence that follows a [+Tone] segment to which a relative pitch has already been assigned, and assigns to the [-Tone] segment or sequence a number that represents a relative pitch three steps lower than that of the preceding [+Tone] segment. (If the pitch of the preceding [+Tone] segment is "Pitch n", that of the [-Tone] segment or sequence is "Pitch n-3".)

The downdrift rule may be stated as follows:

P xxix (P 86):

- (a) $[+Tone]^* \rightarrow [+Pitch\ n]/[+PB]X\_Y$
 (b) $[+Tone]^* \rightarrow [+Pitch\ n+2]/\begin{bmatrix} -Tone \\ +Pitch\ n \end{bmatrix} X\_Y$
 (c) $[-Tone]^* \rightarrow [+Pitch\ n-3]/\begin{bmatrix} +Tone \\ +Pitch\ n \end{bmatrix} X\_Y$

(where X and Y do not include tone-bearing segments other than those affected by the rule, and where X does not include a [+PB])

(The condition to the effect that "X does not include a [+PB]"--i.e., a phrase boundary--is relevant to parts (b) and (c) of the rule, and is intended to block application of the rule across phrase boundaries within a sentence. This condition expresses the fact that downdrift is restricted to the phrase, in the sense that a [-Tone] segment after a phrase boundary may have a pitch higher than that of the last [-Tone] segment that precedes the boundary, and, similarly, a [+Tone] segment after a phrase boundary may have a pitch higher than that of the last [+Tone] segment that precedes the boundary. In fact, however, there is also a kind of downdrift within the sentence as a whole, such that the pitch of the first [-Tone] or [+Tone] segment of each successive phrase is somewhat lower than that of the first similarly-valued segment of the preceding phrase. But we have not, in this text, attempted to formulate rules for intonation beyond phrase boundaries.)

We may illustrate the workings of the downdrift rule with the sentence Ak ɔ̀békó Kùmásé áńòpá yí 'He will go to Kumase this morning.' First, then, part (a) of the rule applies to assign a pitch to the initial tone-bearing segment, ɔ̀-. Let us say that "Pitch n" may be given the value "3" when assigned by part (a) of P xxix to a [-Tone] segment. Then:

ɔ̀békó Kùmásé áńòpá yí
 3
 → ɔ̀békó Kùmásé áńòpá yí

Now part (b) of the rule applies to assign "Pitch n+2" (or "5") to the [+Tone] segment sequence -békó. Thus:

³
 Ǿbékó Kùmásé ánòpá yí
 3 5 5
 → Ǿbékó Kùmásé ánòpá yí

Now part (c) of the rule applies to assign "Pitch n-3"
 (or "2", since "n" here = the "5" of -⁵kó) to the next
 [-Tone] segment, resulting in:

3 5 5 2
 Ǿbékó Kùmásé ánòpá yí

And now part (b) applies to the [+Tone] sequence that fol-
 lows ²Kù-, resulting in:

3 5 5 2 4 4 4
 Ǿbékó Kùmásé ánòpá yí

Finally, after another application of part (c) of the rule,
 and another of part (b), we have:

3 5 5 2 4 4 4 1 3 3
 Ǿbékó Kùmásé ánòpá yí

(In a model which included a level of "physical phonetics" the numbers assigned by P xxix could be replaced by, say, numbers representing fundamental frequencies.)

Although, because of its importance, we have presented and discussed the downdrift rule first among the tone rules with which we shall deal, it should be understood that the rule itself, since it applies only at the phrase level, follows many other tone rules. In particular, all rules that change tonal values (i.e., replace a [+Tone] by a [-Tone], or vice versa) or add tone-bearing segments must precede the downdrift rule.

3.92 The "Drop" or "Mid" Tone.

As was noted in Section 3.90, at the phonetic level, three-way pitch contrasts are found in Akan in certain tonal contexts. Specifically, after a contrastively high

tone, the pitch of the next tone-bearing segment(s) may be on the same level as the immediately preceding material, may be slightly lower than the preceding material, or may be considerably lower than the preceding material. To repeat the examples cited in Section 3.90, the pitch of the second syllable of Ak mébó 'I will strike' is on the same level as that of the first syllable, while the pitches of the second syllables of Ak mé bó 'my stone' and mé bó 'my chest' are, respectively, slightly lower and considerably lower than the pitches of the first syllables. We may call the tone of the second syllable of mébó "high", that of the second syllable of mé bó "drop" (or "mid"), and that of the second syllable of mé bó "low".

Drop tones in Akan occur only after high tones or other drop tones. In initial position, or after a low tone, only a two-way contrast is possible: between a high tone and a low tone. Languages that show this kind of contextual restriction on (phonetic) tonal contrasts have been called (by Welmers (1959)) "terraced level languages".

Stewart (1965) has pointed out that, in the great majority of cases, the occurrence of a high-drop (or drop-drop) pitch sequence may be traced to a high-low-high sequence occurring at a deeper level. For example, Ak mé bó 'my stone' is composed, in the deep structure, of the high-tone possessive pronoun mé 'my' and the noun bó 'stone', which may be analyzed into the low-tone nominal prefix ò- and the high-tone noun root bó. The segmental features of the NomP ò- are always deleted after a possessive pronoun. But the [-Tone] specification of the prefix has its effect upon the surface tone pattern. Let us say that there is a rule which deletes all of the features of ò- in the context in question except the features [+Segment, -Tone]. This rule would have the following effect:

$$\underline{m\acute{e}} + \underline{\acute{o}-} + \underline{b\acute{o}} \rightarrow \underline{m\acute{e}} + \emptyset + \underline{b\acute{o}}$$

If at this point the downdrift rule (P xxix, Section 3.91) applies, its result will be something like: $\overset{5}{\underline{m\acute{e}}} + \overset{2}{\emptyset} + \overset{4}{\underline{b\acute{o}}}$. (We shall assume that "Pitch n" may be given the value "5" when assigned by part (a) of P xxix to a [+Tone] segment.) Now let us further propose that there is a late rule that deletes all segments specified only as

[+Segment, -Tone] (or [+Segment, +Tone]). After this rule has applied, we are left with: $\overset{5}{\underline{m\acute{e}}} + \overset{4}{\underline{b\acute{o}}}$, which we may transcribe as $\underline{m\acute{e}} \underline{b\acute{o}}$ [mí bú]. The postulation of an ordered set of rules, then--(1) segmental feature deletion, (2) downdrift, (3) zero-segment deletion--permits us to account for the occurrence of a drop tone on the phonetic level as arising from an underlying structure in which only high and low tones are specified.

3.93 Tone Incorporation and Tone Simplification.

Actually, both from the point of view of phonetic plausibility and from the point of view of the actual workings of the language, the account of the origin of drop tones provided in Section 3.92 is somewhat oversimplified. When segmental features are deleted but a tonal specification retained, it is plausible to suggest that the retained tone is added either at the end of the preceding syllable or at the beginning of the following syllable, and that, if the syllable to which the tone is added has a different tonal specification from that of the added tone, the result will be a gliding tone. Thus, if we postulate that the rule that deletes the segmental features of $\dot{\underline{b}}$ - after a possessive pronoun adds the [-Tone] specification of $\dot{\underline{b}}$ - at the end of the pronoun, we have the following derivation: $\underline{m\acute{e}} + \dot{\underline{b}}- + \underline{b\acute{o}} \rightarrow \underline{m\acute{e}} + \underline{b\acute{o}}$ (where ^ represents a tone falling from high to low). While we in fact find that in some subdialects, in some constructions, the deletion of segmental features from tone-bearing units results in surface tone patterns in which gliding tones occur, usually gliding tones are not found in Akan. For example, $\underline{m\acute{e}} + \underline{b\acute{o}}$ is in most subdialects, obligatorily realized as [mí bú]. To account for this phonetic realization, we may propose a rule of tonal simplification, which specifies that when a sequence of two tones is found in a single syllable, if either tone is high (or if both are) the sequence is simplified to a single high tone. Thus, in a single syllable, HL/LH/HH $\rightarrow$ H. (The tonal simplification rule also specifies that a sequence of two low tones on a single syllable is simplified to a single low tone: i.e., LL $\rightarrow$ L--see below.) The tonal simplification rule must follow the downdrift rule, P xxix. Thus: $\underline{m\acute{e}} + \dot{\underline{b}}- + \underline{b\acute{o}} \rightarrow$ (by Nom P-deletion) $\underline{m\acute{e}} + \underline{b\acute{o}}$ $\rightarrow$ (by downdrift) $\overset{5-2}{\underline{m\acute{e}}} + \overset{4}{\underline{b\acute{o}}} \rightarrow$ (by

tonal simplification) $\overset{5}{\underline{m\acute{e}}} + \overset{4}{\underline{b\acute{o}}}$ (or $\underline{m\acute{e}} \underline{b\acute{o}}$).

In the case with which we have been dealing, it does not particularly matter whether we say that the low tone of $\underline{b\acute{o}}$ is added at the end of $\underline{m\acute{e}}$ or at the beginning of $\underline{b\acute{o}}$, since, given the rule of tonal simplification and the fact that this rule follows the downdrift rule, both $\underline{m\acute{e}} \underline{b\acute{o}}$ and $\underline{m\acute{e}} \underline{b\acute{o}}$ (where $\sim$ represents a tone rising from low to high) result in $\underline{m\acute{e}} \underline{b\acute{o}}$. There are, however, cases in which it is necessary to specify whether a tone is added at the end of one syllable or at the beginning of the next. For example, the tone of a "zero" subject-concord prefix (SC) (cf. discussion in Section 4.20) is added at the end of the preceding syllable. Thus, given Ak-Fa $\underline{n\acute{e}} + \underline{n\grave{a}} + \emptyset + \underline{b\grave{a}}$ 'His mother comes', this rule operates to derive $\underline{n\acute{e}} + \underline{n\grave{a}} + \underline{b\grave{a}}$. The downdrift rule then applies to this string to derive,

say, $\overset{5}{\underline{n\acute{e}}} + \overset{2}{\underline{n\grave{a}}} + \overset{1}{\underline{b\grave{a}}}$, and tonal simplification results in

$\overset{5}{\underline{n\acute{e}}} + \overset{4}{\underline{n\grave{a}}} + \overset{1}{\underline{b\grave{a}}}$ (or $\underline{n\acute{e}} \underline{n\grave{a}} \underline{b\grave{a}}$), which is the occurring surface pitch pattern. Now if the high tone of the SC had been added at the beginning of $\underline{b\grave{a}}$, rather than at the end of $\underline{n\grave{a}}$, the derivation would have been: Ak $\underline{n\acute{e}} + \underline{n\grave{a}} + \emptyset + \underline{b\grave{a}} \rightarrow \underline{n\acute{e}} + \underline{n\grave{a}} + \underline{b\acute{a}} \rightarrow \overset{5}{\underline{n\acute{e}}} + \overset{2}{\underline{n\grave{a}}} + \overset{4}{\underline{b\acute{a}}} \rightarrow \overset{5}{\underline{n\acute{e}}} + \overset{2}{\underline{n\grave{a}}} + \overset{4}{\underline{b\acute{a}}}$, and the wrong surface pitch pattern would have been predicted.

On the other hand, there is an Akuapem-Asante rule (P 57, cf. discussion in Section 4.91, subsection (e)) which adds a high-tone unit at the beginning of the perfect-aspect prefix /à/ when the immediately preceding tone is high. Thus, given Ak-As $\underline{K\acute{o}f\acute{i}} + \underline{\grave{a}-} + \underline{k\acute{a}s\acute{a}}$ 'Kofi has spoken', this rule operates to derive $\underline{K\acute{o}f\acute{i}} + \underline{\hat{a}-} + \underline{k\acute{a}s\acute{a}}$. To this the

downdrift rule applies, the result being, say, $\overset{3}{\underline{K\acute{o}f\acute{i}}} + \overset{5}{\underline{\hat{a}-}} + \overset{5-2}{\underline{k\acute{a}s\acute{a}}}$. Tonal simplification now results in $\overset{4}{\underline{K\acute{o}f\acute{i}}} + \overset{4}{\underline{\hat{a}}} + \overset{4}{\underline{k\acute{a}s\acute{a}}}$ (or $\underline{K\acute{o}f\acute{i}} \underline{\hat{a}} \underline{k\acute{a}s\acute{a}}$), which is the occurring surface pitch pattern. It is clear that, if a high-tone unit had been added at the end of $\underline{K\acute{o}f\acute{i}}$, or at the end, rather than the beginning, of $\underline{\hat{a}-}$, the wrong surface pitch pattern would have been predicted. (The (vacuous) addition of a high-tone unit at the end of $\underline{K\acute{o}f\acute{i}}$ would have resulted in the

In most cases, a tone-bearing unit that lacks segmental features--i.e., a unit that is specified only as [+Segment,+Tone] or as [+Segment,-Tone]--is incorporated into the preceding, rather than the following, syllable. (This is true whether the [+Segment, α Tone] unit is present in the deep structure as a zero tone-bearing unit, or results from the application of a P-rule.) We shall take advantage of this fact in formulating all P-rules that result in the occurrence of [+Segment, α Tone] units. These rules will not in themselves incorporate the units into either the preceding or the following syllable, but will instead have as outputs strings in which such units occur between syllable boundaries. In those relatively rare cases where the tone of the [+Segment, α Tone] unit is ultimately to be incorporated into the following syllable, this fact will be indicated by a rightward-pointing arrow after the unit. Thus the Akuapem-Asante rule that adds a high tone before a perfect-aspect (PER) prefix that is preceded by a high tone will have some such form as the following:

$$\emptyset \rightarrow \begin{bmatrix} +\text{Segment} \\ +\text{Tone} \end{bmatrix} \rightarrow / [+Tone](C) + \_\_\_ \text{PER}$$

$$[\alpha F] \rightarrow \emptyset / \left[\begin{array}{c} \overline{\text{+NomP}} \\ 3 \end{array} \right] / \text{Possessive} \text{---} \text{Noun Root}$$

After all rules that result in [+Segment, αTone] units have applied, a tone-incorporation rule will move the unit into the following syllable if it is marked with a rightward-pointing arrow and into the preceding syllable if it is not.

The tone-incorporation rule may be stated in two conjunctively-ordered parts as follows:

P xxx (P 85):

$$(a) \begin{bmatrix} +\text{Segment} \\ \alpha\text{Tone} \\ \emptyset F \end{bmatrix} \rightarrow = (C) \rightarrow = (C) \begin{bmatrix} +\text{Segment} \\ \alpha\text{Tone} \\ \emptyset F \end{bmatrix}$$

$$(b) (C) = \begin{bmatrix} +\text{Segment} \\ \alpha\text{Tone} \\ \emptyset F \end{bmatrix} \rightarrow \begin{bmatrix} +\text{Segment} \\ \alpha\text{Tone} \\ \emptyset F \end{bmatrix} (C) =$$

(where $[\emptyset F]$ indicates that no segmental features are present)

(Part (a) of P xxx places the $[+\text{Segment}, \alpha\text{Tone}]$ unit immediately before the vowel of the following syllable; part (b) places it immediately after the vowel of the preceding syllable.)

The tone-incorporation rule may be assumed to precede the downdrift rule. In any event, it precedes the tone-simplification rule, which may be stated as follows:

P xxxi (P 87):

$$\left\{ \begin{bmatrix} \alpha\text{Tone} \\ \beta F \end{bmatrix} \begin{bmatrix} \gamma\text{Tone} \\ \emptyset F \end{bmatrix} \right\} \rightarrow \left\{ \begin{bmatrix} +\text{Tone} \\ \beta F \end{bmatrix} \text{ (where } \alpha \text{ or } \gamma = +) \right\}$$

$$\left\{ \begin{bmatrix} \alpha\text{Tone} \\ \emptyset F \end{bmatrix} \begin{bmatrix} \gamma\text{Tone} \\ \beta F \end{bmatrix} \right\} \rightarrow \left\{ \begin{bmatrix} -\text{Tone} \\ \beta F \end{bmatrix} \text{ (where } \alpha \text{ and } \gamma = -) \right\}$$

(where $[\beta F]$ indicates that segmental features are present and $[\emptyset F]$ indicates that no segmental features are present)

P xxxi operates upon any sequence of two adjoining tone-bearing units one of which is specified for segmental features and the other of which is not. (Such a sequence can result only from the application of the tone-incorporation rule, P xxx.) Its effect is to reduce the sequence of two units to a single unit. This single unit has the segmental feature specifications of the underlying unit that had such features specified, and has high tone ($[+\text{Tone}]$) except in cases where both of the underlying units have low tone ($[-\text{Tone}]$).

We may now illustrate the operation of the tone-incorporation and tone-simplification rules in relation to the downdrift rule. Given an input string such as Ak-Fa né + nà + ø + bà, tone incorporation results in né + nàø + bà, downdrift in né + nàø + bà, and tone simplification in né + nà + bà (or Né nà bà 'His mother comes'). Given an input string such as Ak-As Kòfi + ø + à + kásá (where $\frac{\text{+Segment}}{\text{+Tone}} = \left[\begin{array}{c} \text{+Segment} \\ \text{+Tone} \end{array} \right] \rightarrow$), tone incorporation results in Kòfi + øà + kásá, downdrift in Kòfi + øà + kásá, and tone simplification in Kòfi + à + kásá (or Kòfi ákásá 'Kofi has spoken').

3.94 Other Tone Rules.

At the systematic-phonemic level, only vowels are specified for tone. At the systematic-phonetic level, however, all voiced segments must be so specified. This specification is accomplished by means of a tone-spreading rule, which copies the tone of a vowel onto adjoining voiced non-vowels in the same syllable. This tone-spreading rule may be stated as follows:

P xxxii (P 01):

[+Voiced] $\rightarrow$ [α Tone]/[α Tone]

(This rule reapplies whenever the conditions for its application are met. The rule incorporates the notational device mentioned in Section 3.26, in which the environment is to be interpreted as either preceding or following the segment affected by the rule.) By means of P xxxii, for example, [nám] 'meat' $\rightarrow$ [nám], and Ak-Fa [dów?] 'cultivate' $\rightarrow$ [dów?]. (In phonetic transcriptions in this text, the tones of voiced non-vowels are not normally indicated unless the non-vowels are syllabic.)

There are various other general tonal P-rules that would have to be included in a more complete study of Akan phonology than the present one. For example, Stewart (1962) notes that, in some subdialects of Fante, a pre-pause high tone is in most cases realized with high-rising, rather than high-level, pitch. In these same Fante subdialects,

a pre-pause low tone that follows a high tone is raised phonetically to the level of the preceding high tone. It is also the case that in Asante there is usually a pre-pause lowering of pitch below the levels predicted by the downdrift rule. These pre-pause intonational phenomena are not captured by our present set of rules. Nor, for example, have we attempted to go in any detail into the intonation of yes-no questions, which appears to be marked by a slight raising of the general pitch levels of the sentence, together with a sentence-final interrogative morpheme that may be manifested as an extra-low tone.

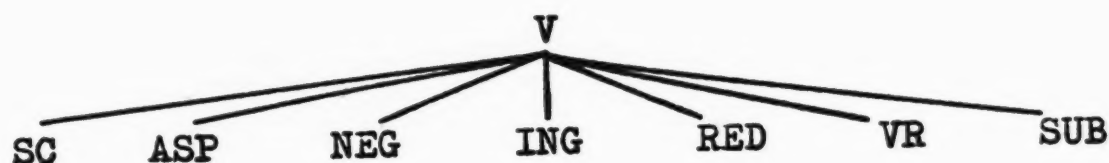
Chapter 4

The Finite Verb

4.10 Surface Structure of the Finite Verb.

This chapter is concerned with the segmental patterns and tone patterns found in certain parts of Akan surface structures that are dominated by the node VP (Verb Phrase). Attention is directed primarily to the parts of such surface structures that are dominated by V (Verb). Akan VPs may include parts dominated by other nodes such as NP (Noun Phrase). The present chapter covers only those features of NP structures--primarily tonal features--that are associated uniquely with the occurrence of these structures as parts of VPs. For example attention is given here to tonal phenomena associated with certain NPs occurring as verbal objects (cf. Section 4.95). On the other hand, the segmental structure of nouns, and the tonal phenomena that are associated with NPs in general, rather than specifically as subparts of VPs, are not discussed.

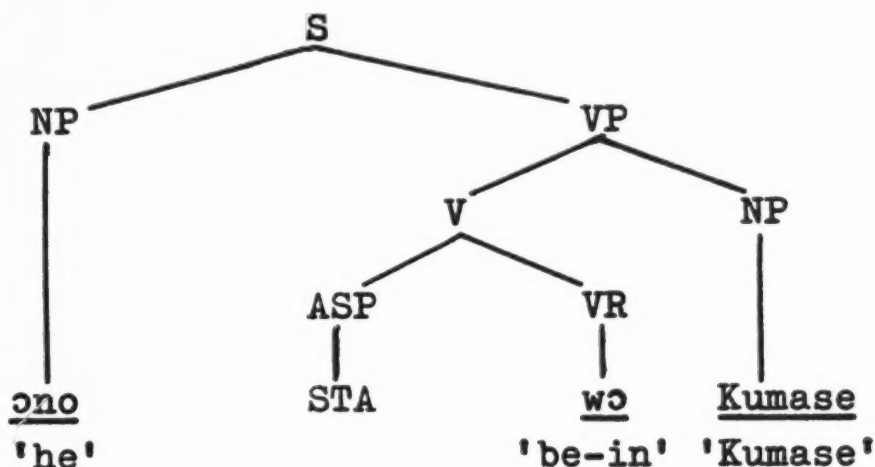
The surface-structure verb phrases that are considered here are those that include a finite verb: i.e., a verb that is marked for aspect. (In addition to finite verbs, Akan surface structure has certain non-finite verb forms, comparable to infinitives or gerunds in European languages. These forms have typically nominal sentence functions, occurring, for example, as subjects or objects.) The surface structure of a finite verb obligatorily includes nodes labeled ASP (Aspect) and VR (Verb Root). Except in the case of imperatives (cf. Section 4.35), it also obligatorily includes a node labeled SC (Subject Concord). Optional nodes in the surface structure of finite verbs are: NEG (Negative), ING (Ingressive), RED (Reduplication), and SUB (Subordinative). The usual order of these nodes relative to one another is shown in the following tree diagram:



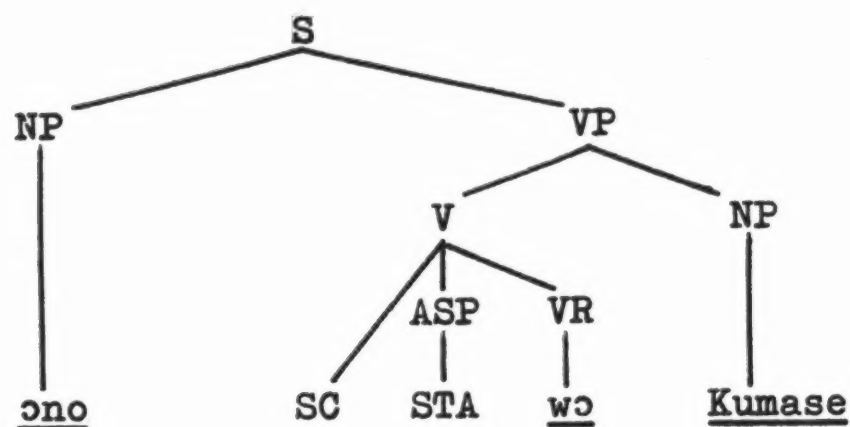
In the sections that immediately follow (Sections 4.20 through 4.81), the components of the finite verb are presented in the order in which they appear in the diagram above. Each presentation includes an account of the systematic-phonemic form(s) of the component under discussion. In addition, some of the presentations include an account of certain P-rules that apply to the component itself or to forms that include it. In most cases, however, these presentations do not include an account of tone-changing P-rules, discussion of the latter being deferred until Sections 4.90 through 4.96.

4.20 The Subject-Concord Prefix.

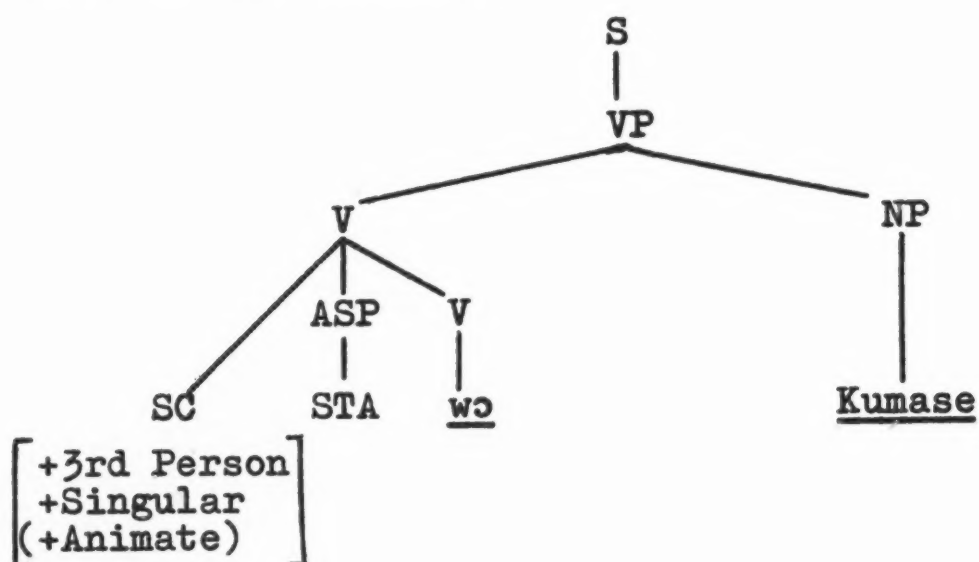
The SC component of the finite verb is a subject-concord prefix. This prefix is not present in the deep structure of the verb, but is, instead, introduced by an obligatory transformation which inserts an SC as the leftmost constituent of any finite verb preceded by a subject. (The transformation fails to operate when the aspect of the following VP is imperative, since in such cases the subject has been deleted by a previous transformation--cf. Section 4.35.) For example, given an input structure such as:



the SC-insertion transformation operates to yield the derived structure:



If, as in the above example, the subject NP is a personal pronoun, a further obligatory transformation applies. This transformation has the effect of transferring to the SC prefix certain syntactic features of the pronominal subject, and then of deleting the pronoun itself from its original position. The features of the pronoun that are transferred to the SC prefix are person, number, and, in the case of third-person pronouns in Akuapem and Asante, animateness. For example, operating upon the derived structure above, this transformation results in the structure:



(The surface representation of the above structure is wo Kumase 'He's in Kumase,' in which the initial wo ([3]) represents the SC prefix.)

The systematic-phonemic forms of the SC prefixes that reflect the operation of the feature-transfer transformation are shown in Table 8.

		<u>Akuapem</u>	<u>Asante</u>	<u>Fante</u>
Singular:	1st person	/bĩ/	/bĩ/	/bĩ/
	2nd person	/wù/	/wù/	/è/~/ì/
	3rd person (animate)	/ò/	/ò/	/ò/
Plural:	1st person	/jè/	/jè/	/jè/
	2nd person	/bũ/	/bũ/	/wò/
	3rd person (animate)	/wò/	/jè/~wò/	/wò/
Inanimate		/è/	/è/	---

TABLE 8

Systematic-Phonemic Forms
of Subject-Concord Prefixes

(The following notes pertain to Table 8.

- (1) The two forms shown for the second-person singular in Fante are subdialectal variants, as are the two forms shown for the third-person plural in Asante.
- (2) In some Fante subdialects, a second-person-plural subject may be expressed in surface forms by the noun hom /húb/ 'you (pl.)', rather than, or in alternation with, the SC prefix /wò/. Hom is best regarded as a noun because of the tone patterns of the structures in which it occurs, which show that, like other nouns in subject position it is followed by an SC prefix--see below.

- (3) As the chart indicates, Fante lacks a distinctive inanimate SC prefix, and uses the same third-person forms for animates and inanimates alike. In Akuapem and Asante, no number distinction is made in the case of the inanimate SC prefix.)

The forms shown in Table 8 may undergo certain changes through the operation of P-rules. Some of these rules affect the segments of the SC prefixes, others their tones. P-rules affecting the segments of the SC prefixes include: the regressive non-vowel nasalization rule, P 06, which, e.g., changes /bĩ/ to [mĩ]; the tenseness-harmony rule, P 69, which, e.g., changes [mĩ] to [mĩ̃] before VRs with [+Tense] vowels; and the Fante backness-harmony rule, P 78, which, e.g., changes [mĩ̃] to [mũ̃] and [mĩ̃] to [mũ̃] before VRs with [+Back] vowels. One rule affecting the tones of SC prefixes is P 52, which replaces the low tone of second-person SCs other than Fante /wò/ by high. (Low tone is postulated for the systematic-phonemic forms of the second-person SCs because certain P-rules that normally apply to VRs that follow a low tone--e.g., the Akuapem-Asante rule, P 20, that changes the tone of a VR like /kàsà/ 'speak' to Ak [kàsá]/As [kàsá] after a low tone--do apply when the VR follows a second-person SC.)

If the subject noun phrase is something other than a non-emphasized pronoun, the feature-transfer transformation discussed above does not apply. In such cases, the systematic-phonemic form of the SC prefix is /ø/: i.e., a low-tone ([-Tone]) segment unspecified for any other features. This zero SC prefix undergoes the same tone-changing P-rules as other SC prefixes (cf., for example, Section 4.91), which may result in a replacement of the original low tone on the prefix by high ([+Tone]). After these tone changing P-rules have applied, a low-tone zero SC prefix is deleted in Akuapem and Asante, by means of P 64, but retained in Fante. (A high-tone zero SC prefix is retained in all dialects.) Then, the tone incorporation rule, P 85, adds the tone of a retained zero SC prefix at the end of the immediately preceding syllable (i.e., the last syllable of the subject NP). For example, P 85 changes:

Ak-Fa [nĩ nã ɔ̀bà]
'his' 'mother' 'comes'

to:

Ak-Fa [nĩ nã bà]

(which, after the application of further P-rules, is realized as Ak-Fa [nĩ nã bà] 'His mother comes'). Since a low-tone zero SC prefix is deleted in Akuapem and Asante by P 64, it is not available for tone incorporation in these dialects. A low-tone zero SC prefix is, however, available for tone incorporation in Fante. Thus, given the following input to P 64:

[kòfí òbébá]
'Kofi' 'will-come'

this rule deletes the SC prefix in Akuapem and Asante, resulting in the surface tone pattern:

Ak-As [kòfí bébá] 'Kofi will come.'

Because P 64 does not apply in Fante, however, the SC prefix of [òbébá] is available for application of the tone incorporation rule in this dialect, resulting in:

Fa [kòfí bébá]

which, after the application of further P-rules, is realized as:

Fa [kòfí bébá] 'Kofi will come.'

4.30 ASPECT.

In the base component of Akan grammar, the obligatory ASP constituent of a finite verb is rewritten in one of seven ways: (1) STAtive; (2) HABitual; (3) PROgressive; (4) PAST; (5) PERFect; (6) FUTure; (7) OPTative. These seven may be called the basic aspects of the Akan verb. In addition to these, there are two derived aspects which result from the operation of transformational rules upon one of the basic aspects; these are: (8) IMPerative; (9) CONsecutive.

STA (which is equivalent to what some other authors have called the 'continuative') stands apart from the other eight aspects with regard to the verb roots with which it co-occurs. The other eight aspects may collectively be called ACTIVE. With very few exceptions, any

verb root that co-occurs with any one of them also co-occurs with each of the others. STA, on the other hand, fails to co-occur with many of the verb roots that co-occur with ACT, and there are a number of verb roots that co-occur with STA but not with ACT. Thus, for example, the verb root ba 'come' occurs only with the eight active aspects while the verb root wɔ 'have, be in' occurs only with STA. On the other hand, many verb roots occur with both STA and ACT: e.g., the root hyɛ, which has the meaning 'be wearing' with STA, the meaning 'put on' with ACT. In the lexicon, each verb root is marked as [+STA__] or [-STA__]: i.e., as co-occurring or failing to co-occur with STA. Verb roots that are [-STA__] are automatically marked, by means of a redundancy rule, as [+ACT__]: i.e., as co-occurring with the eight active aspects. The root ba is, for example, [-STA__] and therefore [+ACT__]. [+STA__] verb roots are subdivided into two classes, [+ACT__] and [-ACT__], on the basis of whether or not they co-occur with ACT in addition to STA. Thus wɔ is [+STA__] and [-ACT__] while hyɛ is [+STA__] and [+ACT__].

The nine aspects of the finite verb will now be discussed, in the order in which they are listed above.

4.31 STative and HABitual.

STA and HAB are alike in that they both have zero segmental forms. They must be distinguished from one another, however, because of their differing effects upon the tones of other elements of the finite verb, as is illustrated by examples such as:

	<u>STA</u>	<u>HAB</u>
Ak, Fa	<u>òhyè</u> 'he is wearing'	<u>óhyè</u> 'he puts on'
Fa	<u>ónhyé</u> 'he isn't wearing'	<u>ònhyé</u> 'he doesn't put on'
As	<u>wónhyé</u> 'you aren't wearing'	<u>wònhyé</u> 'you don't put on'

	<u>STA</u>	<u>HAB</u>
As	<u>òmfi hó</u>	<u>òmfi hó</u>
	'he isn't from there'	'he doesn't leave there'

In those cases in which forms that include STA and those that include HAB differ tonally, the differences are accounted for on the basis of different P-rules that apply in the presence of the one or the other aspectual morpheme (cf. Sections 4.91 and 4.92). Thus, although both STA and HAB are listed in the lexicon as segmentally zero, the difference between them must be preserved in inputs to the P-rules. This is easily done, since they may be identified as $STA[\emptyset]$ and $HAB[\emptyset]$ (i.e., zero dominated by STA and zero dominated by HAB) respectively. (HAB is specified as having low tone in order to account for the operation of certain P-rules. There does not seem to be a need to specify a tone for STA.)

4.32 PROgressive.

The systematic-phonemic form of the PRO aspect is /dì/. The surface realizations of PRO, however, have initial [r] (except in those cases in which the CV form of the morpheme is replaced by another form by means of P-rules--see below). As was noted in Section 3.40, [r] does not normally occur initially in native Akan morphemes, but is, instead, in complementary distribution with [d], which occurs only morpheme-initially. (That is, at the systematic-phonemic level, [d] and [r] are not distinct.) The fact that [r] occurs in the surface realization of the PRO morpheme hence suggests that this morpheme is, in some sense, functioning as if it were part of a larger unit that is responsive to the P-rule, P 15, governing the distribution of [r] and [d]. In this connection, it may be noted that, in inputs to the phonological component, PRO does, in fact, always follow a subject-concord prefix (cf. Section 4.20). Now if one postulates a rule eliminating morpheme boundaries between subject-concord prefixes and aspectual morphemes, P 14, the /d/ of PRO, after the operation of this rule, occurs in medial position. In this position, it is automatically susceptible to P 15.

Although there is good evidence that PRO has an underlying CV form, the surface forms that reflect the occurrence of PRO often have some other shape: a vowel or simply a tone pattern. In fact, surface forms of PRO that derive directly from /dĩ/ do not occur at all in colloquial Asante, and in both Akuapem and Fante occur principally as stylistic variants of other, perhaps more common, forms.

In Asante, verbs that include PRO are obligatorily subject to P 56. This rule operates in three steps: (a) first, it deletes all of the segmental features of the PRO morpheme, leaving only the tone intact; (b) second, if the morpheme immediately preceding PRO ends in a [+Low] vowel (i.e., [A]), it replaces this vowel by its [-Low] counterpart (i.e., [E]); (c) third, if the morpheme immediately preceding PRO ends in a vowel (including an [E] that results from step (b) of the rule), it copies the segmental features of this vowel in the place originally occupied by the segmental features of the vowel of PRO. Some examples of the operation of the rule in Asante are:

Before P 56	(a)	(b)	(c)
[òdúm rìbá] (Odum is-coming)	[òdúm øbá]		
[àtá rìba] (Ata is-coming)	[àtá øba]	[àté øbá]	[àté èbá]
[kòfí rìbá] (Kofi is-coming)	[kòfí øbá]		[kòfí ìbá]
[òrìbá] (he-is-coming)	[òøbá]		[òòbá]

([òdúm øbá] is ultimately realized as [òdúm bá] through application of subsequent P-rules.) (In spite of the obligatory operation of P 56 in colloquial Asante, the PRO morpheme is represented by re in conventional Asante orthography: Odum reba 'Odum is coming,' Ata reba 'Ata is coming,' etc.) (If PRO is followed by the NEGative morpheme /N/--cf. Section 4.40--there are several tone-changing P-rules that precede P 56, and only step (a) of P 56 applies. For examples, cf. Section 4.92, subsection (b).)

In Akuapem and Fante, P 56 is optional. If P 56 is not applied, the vowel of the PRO prefix may undergo certain changes in accordance with the tenseness-harmony rule (P 69) and/or the Fante backness harmony rule (P 78). These rules account for forms such as: Ak-Fa ɔreba [òríbà] 'he is coming', Ak ɔredi [òrídi]/Fa ɔredzi [òrídzi] 'he is eating', Fa ɔroko [òrúkò] 'he is going', and Fa ɔrodum [òrúdum] 'he is extinguishing'. (PRO is normally represented by re in Akuapem orthography and by either re or ro in Fante orthography. Tenseness harmony is not reflected in the spelling either of PRO or of a preceding SC.)

4.33 PASt and PERfect.

The PAS aspect is the only aspect that is represented, in surface forms, by a suffix attached to the verb root, the other aspects being represented either by prefixes or by zero segmental forms. Since all aspectual morphemes precede the verb root in deep structure, there must be a transformation that moves PAS to post-verb-root position. This transformation is roughly:

	X - PAS - (NEG) (ING) (RED) VR - Y			
SD:	1	-	2	- 3 - 4
SC:	1	-	∅	- 3 + 2 - 4

(This transformation follows the transformations that replace PERfect by PAS and PAS by PER in negative verb forms--see below and Section 4.41.)

The systematic-phonemic form of the PAS suffix is /i/, while that of the PER prefix is /à/. (In Asante, but not in the other two dialects, the past suffix has an alternate, disyllabic, form, /i=jɛ/.) In the presence of the NEGative morpheme, transformational rules apply which replace deep-structure PAS by surface-structure PER, and vice versa. That is, verb forms that have a negative past meaning involve the prefix /à/, while those that have a negative perfect meaning involve the suffix /i/.

Thus the negative of:

<u>Kofi</u> <u>yii</u> .	'Kofi removed it.'
(Kofi removed)	

is:

Ak-As <u>Kofi</u> <u>anyi</u> .	
Fa <u>Kofi</u> <u>enyi</u> .	'Kofi didn't remove it.'
(Kofi didn't- remove)	

while the negative of:

Ak-As <u>Kofi</u> <u>ayi</u> .	
Fa <u>Kofi</u> <u>eyi</u> .	'Kofi has removed it.'
(Kofi has- removed)	

is:

<u>Kofi</u> <u>nyii</u> .	'Kofi hasn't removed it.'
(Kofi hasn't- removed)	

(The n in the negative forms represents the negative prefix--cf. Section 4.40. The e [e] in the Fante negative past and affirmative perfect is a reflex of underlying /a/, and results from the operation of P 69 and P 84--see below. The transformational rules that perform this switching of PAS and PER in negative verbs are presented in Section 4.41. The balance of the present section is devoted to a discussion of certain P-rules that affect the segmental forms of Vs that include the PAS or PER morphemes. This discussion is arranged as follows: (a) rules affecting "transitive" formations with PAS; (b) rules affecting "intransitive" formations with PAS; (c) rules affecting forms with PER.

(a) It is customary to distinguish between "transitive" and "intransitive" formations that include the PAS suffix. The "intransitive" formations occur at

the end of a sentence or clause; the "transitive" formations occur in most other contexts: e.g., immediately before a nominal serving as a direct or indirect object.

The first rule affecting the segmental form of formations that include PAS, P 34, applies to both transitive and intransitive formations. P 34 operates to lengthen any pre-PAS VR that ends in a vowel at the point in the P-rules at which it applies. The lengthening consists in the addition of a low-tone copy of the VR-final vowel to the VR. Thus ba [bá] 'come' +/ì/→[báà]/+ì/, hwe [cɔ́é] 'look at' +/ì/→[cɔ́éè]/+ì/, bu [bú] 'break' +/ì/→[búù]/+ì/, bo [bó] +/ì/→[bóò]/+ì/, etc. (P 34 does not affect VRs that end in a non-vowel at the point in the P-rules at which it applies. Such VRs, however, may acquire a VR-final vowel before the PAS suffix by means of another rule, P 31--cf. Section 4.73.)

In the case of transitive formations, the PAS suffix itself is obligatorily deleted in all dialects, by means of P 36. Since P 36 follows P 34, the form that remains when the suffix is deleted shows, in appropriate cases, the effects of P 34: that is, it shows a lengthening of a VR-final vowel: e.g.,

<u>Obaa Kumase.</u>	'He came to Kumase.'
<u>Ohwee Kofi.</u>	'He looked at Kofi.'

(For the tone patterns of the cited formations, see Section 4.91.) In the case of roots that have a VR-final non-vowel at the point at which P 36 applies, and which have thus not been subject to P 34, the deletion of the PAS suffix in transitive formations, by means of P 36 leaves a formation that is segmentally identical to a HABitual-aspect formation. In Asante, however, the segmental distinction between PAS and HAB formations is restored through the operation of a second step of P 36, which adds a low-tone copy of a VR-final non-vowel to a formation from which the PAS suffix has been deleted by means of the first step of the rule. This second step of P 36 is, for example, responsible for the final [m] of the verb in:

As [òfèmm̃ sɪká] 'He borrowed money.'

(cf. As [òfém siká] 'He borrows money.')

(The second step of P 36 does not apply in Akuapem and Fante, and thus habitual and transitive-past formations in these dialects show only tonal distinctions: e.g.,

Ak-Fa [òfém siká] 'He borrowed money.'

(cf. Ak-Fa [ófém siká] 'He borrows money.'))

Fante has one further rule that affects the segmental forms of certain transitive-past formations. This is P 35, which deletes the vowel that has been added by P 34 (see above) in transitive formations involving disyllabic VRs with underlying voiced medial consonants (cf. Section 4.75). This rule is responsible for the segmental difference between Fa [òtçirè kòfi] and Ak-As [òtçirèè kofí] 'He showed Kofi.' (The VR in these examples is kyere [tçiré] 'show', whose underlying form is /kidé/.)

(b) In intransitive formations that include PAS, the suffix vowel /i/ (but not the second vowel of As /i=jè/) is made to agree in tenseness and nasality with the preceding vowel. The underlying [-Tense, -Nasal] vowel of the suffix is changed to [+Tense] after a [+Tense] vowel by P 69, and to [+Nasal] after a [+Nasal] vowel by P 73. Note the suffix vowels in the following Asante intransitive-past forms: [òbààì(jè)] 'he came', [òbùùì(jè)] 'he broke', [òmäääì(jè)] 'he gave', [òhùùí(jè)] 'he saw'.

There is a two-part vowel-assimilation rule, P 37, that affects certain intransitive-past formations. The first part applies in all dialects. This part of the rule, which changes certain occurrences of [U] to [I] before the PAS suffix, is responsible for the quality of the underlined vowel in, e.g., Ak [òhúrwiì]/As [òhùrìì(jè)] 'he washed' (cf. the transitive-past formations in Ak [òhúrù kúruwá nú]/As [òhùrù kúruwá nú] 'He washed the cup.'). (For further discussion, cf. Section 4.74.)

The second part of P 37, which is specific to Fante, affects any sequence of two identical [+Back] vowels that precede the PAS suffix. (The vowels affected are a VR-final vowel and a low-tone copy of it that has been added by P 34.) The rule operates to change the [+Back] vowels to their [-Back] counterparts before the suffix. Thus the

sequence [uu] is changed to [ii], [ɔɔ] to [ɛɛ], etc. Examples are:

	<u>Before P</u>		<u>After P</u>
Fa	[òdwúùì]	'he arrived'	→ [òdwiìì]
Fa	[òbwóòì]	'he beat (it)'	→ [òbwéèì]

(The VRs in the above examples have the underlying forms /dút/ and /bó/ respectively. The labialization of the root-initial consonants in the examples results from the operation of P 09, which precedes the rule under discussion. In phonetic transcriptions elsewhere in this text, the effects of P 09 are sometimes not shown.)

In both Akuapem and Fante, sequences of three vowels at the end of intransitive-past formations are normally subject to contraction by means of P 38. In Akuapem, the contraction consists of the deletion of the vowel that has been added by P 34 before the PAS suffix: e.g.,

	<u>Before P</u>		<u>After P</u>
Ak	[òbáàì]	'he came'	[òbái]
Ak	[òdúùì]	'he arrived'	[òdúi]

(The Akuapem surface forms in the right-hand column may be compared with the corresponding Asante surface forms: [òbààì(jè)], [òdùùì(jè)]. P 38 does not apply in Asante.) In Fante, the contraction (which may not occur in all sub-dialects) consists of the deletion of the PAS suffix: e.g.,

	<u>Before P</u>		<u>After P</u>
Fa	[òbáàì]	'he came'	[òbáà]
Fa	[òdwiìì]	'he arrived'	[òdwiì]

Note that in Fante, the PAS suffix is generally deleted in both transitive and intransitive PAS formations. (In Akuapem and Asante, on the other hand, it is

deleted only in transitive formations.) In some cases this results in homophony between the transitive and intransitive forms: e.g.,

Fa [òbáà kùṁǎsí] 'He came to Kumase.'
 Fa [òbáà] 'He came.'

In other cases, however, the application of the vowel-assimilation rule, P 37, to the intransitive forms and its non-application to the transitive forms results in contrasts such as:

Fa [òdúù kùṁǎsí] 'He arrived at Kumase.'
 Fa [òdwíi] 'He arrived.'

(The ordering of the P-rules is crucial in accounting for such cases. In the transitive formations the PAS suffix has already been deleted at the point in the rules at which vowel assimilation applies, and hence P 38 is inapplicable. In the intransitive formations, the PAS suffix is not deleted until after the vowel assimilation rule has applied.)

(c) There are two P-rules that affect the segmental forms of verbs that include the PER prefix /à/. One of these, P 42, changes the segmental form of SC prefixes that precede PER. (P 42 also affects formations that include the CONsecutive-aspect prefix /à/--cf. Section 4.36.) In general, the rule operates to replace the vowel of SC by [a] (or [ǎ], when the vowel of SC is [+Nasal]), before the [à] of PER, changing [mí] 'I' to [mǎ], Ak-As [wó] 'you (sg)' to [wa], [jé] 'we' to [ja], etc. However, if the SC is Fa [ɛ] ~ [i] 'you (sg)' or Ak-As [ɛ] 'it, they (inanimate)', P 42 deletes it before PER, and if the SC is [ɔ] 'he, she, Fa it', P 42 replaces it by [wa] before PER. (In conventional orthography, the changes effected by P 42 are accurately reflected in some cases, e.g., Ak aba [ábà] 'it has come', partly reflected in other cases, e.g., Ak waba [wàábà] 'he has come', and in still other cases not reflected at all, e.g., Ak ysaba [jàábà] 'we have come'.)

The second P-rule that affects the segmental forms of verbs that include PER is the tenseness-harmony rule, P 69, which changes the PER prefix from [à] to [è] if the first vowel of the VR is [+Tense]. Then a later rule, P 84, changes [è] to Ak-As [ə]/Fa [e] in this context. The

tensing rule affects the [A] of any SC prefix that precedes PER, as well as PER itself. Conventional Akuapem and Asante orthography do not represent the change from [à] to [â], but conventional Fante orthography does represent the change from [à] to [è]: compare, e.g., Ak-As mabisa [mààbísé] and Fa mebisa [mèèbísè].)

4.34 FUTURE.

The systematic-phonemic form of the FUTURE prefix is /bɛ́/. It is probable that this morpheme is related to the INGRESSIVE prefix /bɛ́/ 'come (in order) to' and thus ultimately to the verb /bá/ 'come' (cf. Section 4.50). In this connection, it is suggestive that the future and the ingressive prefixes fail to co-occur: i.e., that there are no future ingressive forms. However, future forms and ingressive forms are, at least in Akuapem and Asante, tonally distinct in most cases, and this--together with the ambiguity of those forms that are not tonally distinct--seems sufficient grounds for distinguishing the FUT and the ING prefixes. (In Fante, the future is identical, both segmentally and tonally, with the habitual ingressive. Thus:

Fa	<u>ɔ̀bɛ́yɛ́</u>	{ 'He will do it.' 'He comes to do it.' }
cf. Ak-As	<u>ɔ̀bɛ́yɛ́</u>	'He will do it.'
Ak-As	<u>ɔ̀bɛ́yɛ́</u>	'He comes to do it.')

In the presence of NEG, a transformational rule applies which replaces deep-structure FUT by surface-structure PRO (i.e., the progressive-aspect prefix). The result of this transformation is to make the negative future and the negative progressive homophonous. Thus:

<u>ɔ̀renyɛ</u>	{ As [ɔ̀ɲɲɛ́ʔ] Ak-Fa [ɔ̀(rí)ɲɲɛ́ʔ] }	{ 'He won't do it.' 'He isn't doing it.' }
----------------	---	---

As an alternative to this rule, Fante has a rule replacing the FUT prefix /bɛ́/ by the prefix /kɔ́/ in the context of

the negative morpheme. (/kɔ̃/ is, interestingly, an ingressive prefix meaning 'go (in order) to'--cf. Section 4.50.) The transformational rules that effect these changes in the presence of the negative morpheme are presented in Section 4.41.

In all dialects, the vowel of /bɛ̃/ (together with the vowel of any SC prefix that may precede it) is subject to the tenseness-harmony rule, P 69, and in Fante it is also subject to the backness-harmony rule, P 78. Thus in Akuapem and Asante the prefix is realized as [bɛ̃] before [-Tense] vowels and [bɛ̃] before [+Tense] vowels, while in Fante it is realized as [bɛ̃] before [-Tense, -Back] vowels, [bɛ̃] before [+Tense, -Back] vowels, [bɔ̃] before [-Tense, +Back] vowels, and [bɔ̃] before [+Tense, +Back] vowels. The conventional orthographies reflect this variation. Some examples are:

	<u>ɔbɛba</u>	'he will come'
	<u>ɔbefi</u>	'he will leave'
{ Ak-As	<u>ɔbɛbɔ</u>	'he will beat'
{ Fa	<u>ɔbɔbɔ</u>	
{ Ak-As	<u>ɔbebu</u>	'he will bend'
{ Fa	<u>ɔbobu</u>	

In Akuapem and Asante, when the FUT prefix is preceded by the first-person-singular SC prefix /bɛ̃/ (whose usual surface forms are [mɛ̃] and [mɛ̃]), the vowel of the SC and the consonant of FUT are deleted, by means of P 81. Some examples illustrating the effect of P 81 (which may be optional in some subdialects) are:

Ak-As	<u>mɛ̃bá</u>	'I will come' (cf. Fa <u>mɛ̃bɛ̃bá</u>)
Ak-As	<u>mɛ̃fí</u>	'I will leave' (cf. Fa <u>mɛ̃bɛ̃fí</u>)

Christaller, in his *Grammar* (p. 59), identifies a verb form which he calls the 'second future', a verb form marked by the prefix re plus the prefix bɛ̃. This form, however, may be identified as the progressive ingressive, rather than a distinct aspect. (For further discussion, cf. Section 4.50.)

4.35 OPTative and IMPerative

The fully-specified morphophonemic form of the OPTative is / $\acute{N}$ /: i.e., a [+Nasal,+Tone] segment with other features unspecified. Phonetically / $\acute{N}$ / is realized as a nasal consonant that is homorganic with the consonant that follows it. Thus it is [m] before bilabials, [ɱ] before labiodentals, [n] before alveolars, etc. (cf. P 25). In Akuapem and Asante, but not in Fante, a [-Nasal] voiced non-vowel following / $\acute{N}$ / is changed to its [+Nasal] counterpart by means of P 72: compare Ak-As [ɔ́mmɔ́]/Fa [ɔ́mbɔ́] 'he should beat', Ak-As [ónnú?]/Fa [óndú?] 'he should arrive', etc.

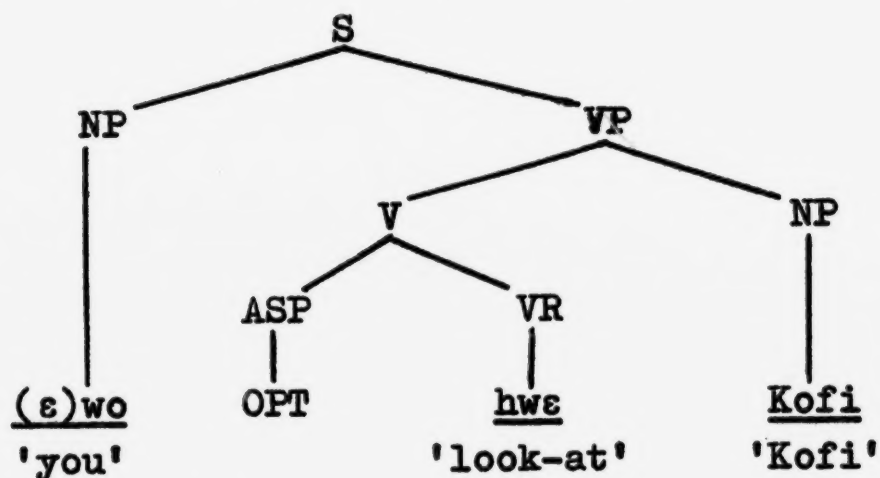
In the presence of NEG, a transformational rule applies which replaces deep-structure OPT by surface-structure HAB. That is, the negative optative is phonetically identical with the negative habitual. (The negative optative and negative habitual are, however, differentiated orthographically: e.g., ɔnnɔ [ɔ́nnɔ́?] 'he shouldn't do it' vs. ɔnyɛ [ɔ́nnɔ́?] 'he doesn't do it'. For a presentation of the pertinent transformation, and for further discussion and examples, cf. Section 4.41.)

The IMPerative aspect, like STA and HAB (cf. Section 4.31), has a zero segmental form. Since IMP forms differ from STA and HAB forms tonally (and in certain other ways), the difference between these various zero forms must be preserved in inputs to P-rules. Thus, just as the STA and HAB forms are identified as including STA[$\emptyset$] and HAB[$\emptyset$], the IMP forms are identified as including IMP[$\emptyset$].

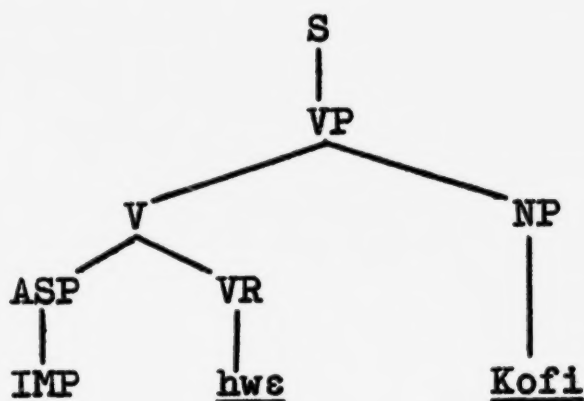
As was noted previously, IMP is a derived aspect. It is introduced into inputs to the phonological component as a replacement for OPT when the deep-structure subject is a second-person-singular pronoun. IMP and OPT are in complementary distribution, IMP occurring only when the deep structure has a second-person-singular-pronoun subject, OPT only when it does not. (OPT, rather than IMP, occurs when the subject is a second-person-plural pronoun.) The rule that replaces OPT by IMP also deletes the subject pronoun itself. It has some such form as:

	X	-	NP		-	OPT	-	Y
			$\left[\begin{array}{l} +\text{Pro} \\ +\text{2nd Person} \\ +\text{Singular} \end{array} \right]$					
SD:	1	-	2		-	3	-	4
SC:	1	-	$\emptyset$		-	IMP	-	4

where the second element in the structural description represents Ak-As wo/Fa ɛwo 'you (singular)'. The rule operates, for example, on a tree such as:



to yield the derived tree:



The phonological component converts this derived tree into the sentence:

Hwe Kofi. 'Look (you-sg.) at Kofi.'

(This sentence may be compared with such sentences as:

	<u>Onhwe</u> <u>Kofi</u> .	'He should look at Kofi.'
{ Ak-As	<u>Monhwe</u> <u>Kofi</u> .	'Look (you-pl.) at Kofi.'
{ Fa	<u>Wonhwe</u> <u>Kofi</u> .	

These sentences have optative verb forms. Note that the transformation that deletes the imperative subject precedes the subject-concord-insertion transformation. This ordering means that the imperative lacks a subject-concord prefix, since the structural description for the subject-concord insertion rule (cf. Section 4.20) requires a subject. Optative verb forms, on the other hand, like all finite verb forms other than the imperative, include a subject-concord prefix.)

Like OPT, IMP is transformationally replaced by HAB in the presence of NEG. That is, the negative imperative is, in surface forms, identical with the negative habitual (except that, as a result of the transformation discussed above, the imperative form lacks a subject-concord prefix).

There are two verb roots, ba /bá/ 'come' and d(z)e /dì/ 'use, take', which show suppletive forms--respectively bra /bidá/ and fa(r(e)) /fát/--in the OPT and IMP. (The notations d(z)e and fa(r(e)) indicate dialectal variation. De and dze are, respectively, the Akuapem-Asante and the Fante spelling that correspond to the systematic-phonemic representation /dì/. In the case of fa(r(e)), the final /t/ of the systematic-phonemic form /fát/ is always replaced by glottal stop (which is not represented in conventional spelling) in Akuapem, and is sometimes replaced by glottal stop in the other dialects as well. In certain contexts, however, [fár?] occurs in Fante surface forms and [fárí] in Asante surface forms--cf. Sections 4.72 and 4.73.)

The suppletive form of ba occurs only in the affirmative. Thus:

<u>Kofi</u> <u>mmra</u> .	'Kofi should come.'
<u>Bra</u> .	'Come (you-sg).'

vs:

{	Ak-As	<u>Kofi</u> <u>mma</u> .	'Kofi shouldn't come.'
	Fa	<u>Kofi</u> <u>mba</u> .	
{	Ak-As	<u>Mma</u> .	'Don't (you-sg.) come.'
	Fa	<u>Mba</u> .	

(In the Akuapem and Asante forms of the affirmative OPT and of the negative OPT and IMP, the initial /b/ of /bidá/ and /bá/ is replaced by [m] as a result of the operation of P 72, the rule that nasalizes voiced non-vowels after nasal consonants.) /fàt/ replaces /dì/ in both affirmative and negative OPT and IMP forms:

	<u>Kofi</u> <u>mfa</u> <u>mma</u> <u>me</u> .	'Kofi should give it to me.'
	(Kofi should-take should-give me)	
	<u>Fa</u> <u>na</u> <u>me</u> .	'Give (you-sg.) it to me.'
	<u>Kofi</u> <u>mmfa</u> <u>mma</u> <u>me</u> .	'Kofi shouldn't give it to me.'
	<u>Mfa</u> <u>mma</u> <u>me</u> .	'Don't give it to me.'
(cf. {	Ak-As <u>Kofi</u> <u>de</u> <u>ma</u> <u>me</u> .	'Kofi gives it to me.'
	Fa <u>Kofi</u> <u>dze</u> <u>ma</u> <u>me</u> .	
	(Kofi takes gives me.)	

In the case of the negative forms, however, the replacement of /dì/ by /fàt/ is part of a more general system of suppletion, since the replacement occurs in all negative forms. (Cf. Section 4.40, in which, also, there is a discussion of certain syntactic peculiarities of d(z)e.)

4.36 CONsecutive.

The second of the derived aspects, the CONsecutive, is introduced into surface structures in one of two ways: as a replacement for PROgressive or FUTure in non-initial verbs of serial-verb constructions; and as a replacement for FUTure in purpose clauses. Examples of the first type are:

Oresan aba. 'He is coming again.'
(he-is-returning he-is-coming)

Obesan aba. 'He will come again.'
(he-will-return he-will-come)

(The form aba consists of a zero subject-concord prefix, the CON prefix a- and the verb root ba 'come'.) An example of the second type is:

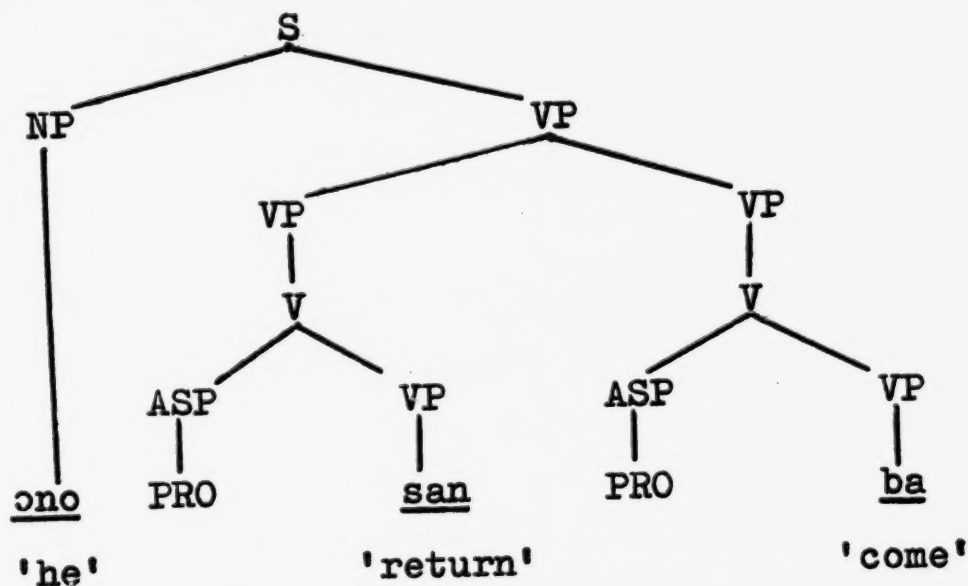
Ak-As { Mefrɛɛ } no na waba. 'I called him so
Fa { Mefrɛ } that he would
(I-called him that come.'
he-will-come)

The transformational rule that replaces PRO or FUT by CON in non-initial verbs of serial-verb constructions has some such form as:

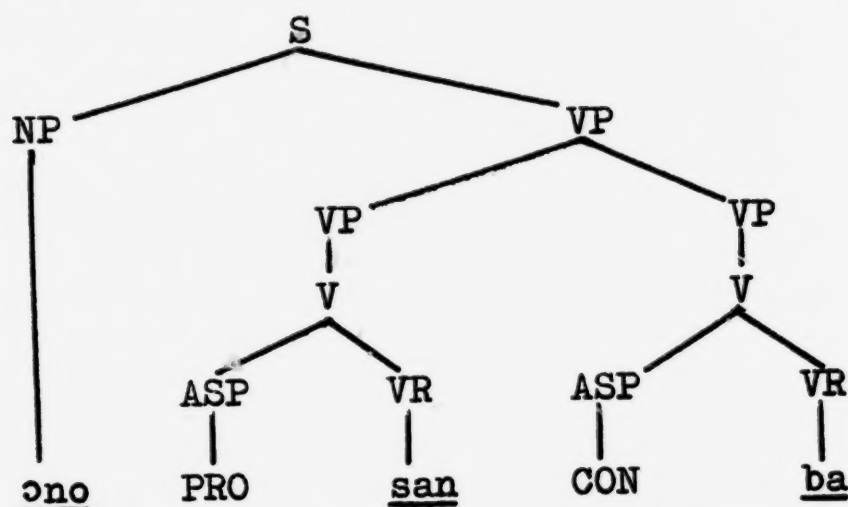
$$X - VP - \begin{Bmatrix} \text{PRO} \\ \text{FUT} \end{Bmatrix} - Y$$

SD: 1 - 2 - 3 - 4
SC: 1 - 2 - CON - 4

This rule would, for example, operate on a tree such as:



to yield the derived tree:

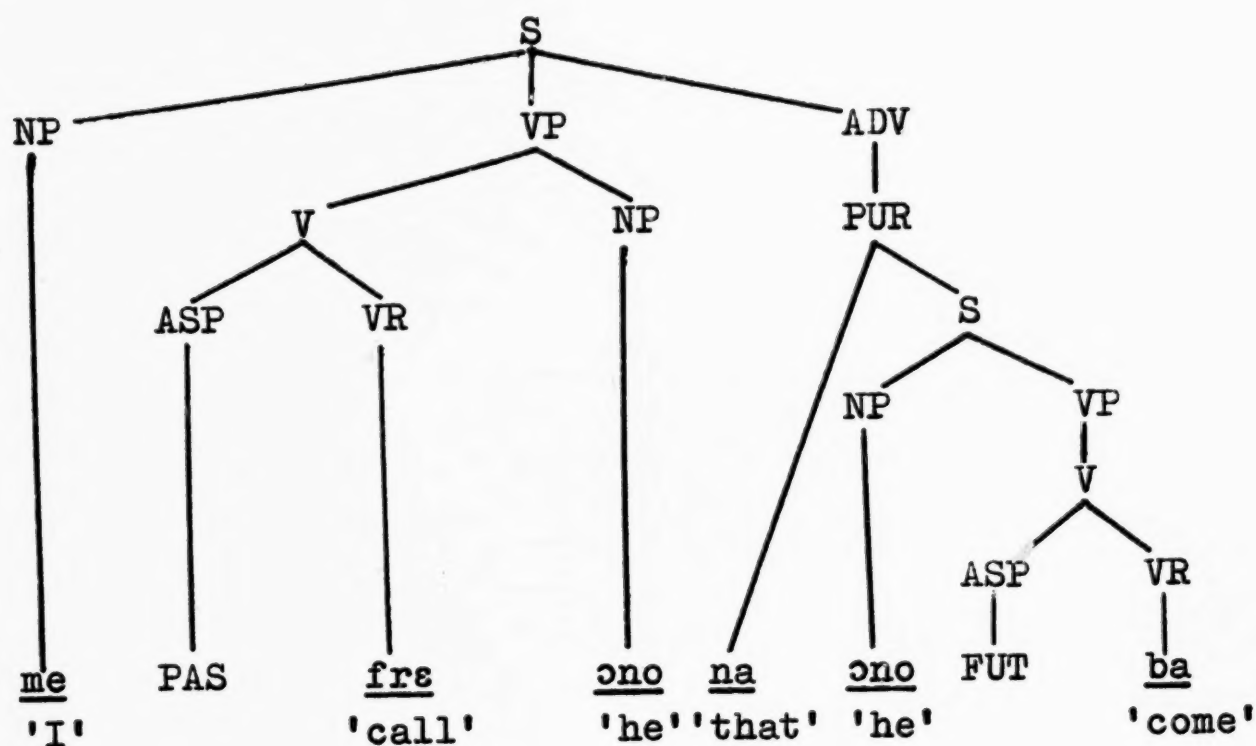


which, after certain other operations, would be converted by the phonological component into the sentence ono resan aba. (The original tree is itself the product of whatever transformations are involved in the generation of serial-verb constructions of this type. It is assumed here that the rule that replaces PRO or FUT by CON precedes the rules, mentioned in Section 4.20, that introduce subject-concord prefixes and delete pronoun subjects.)

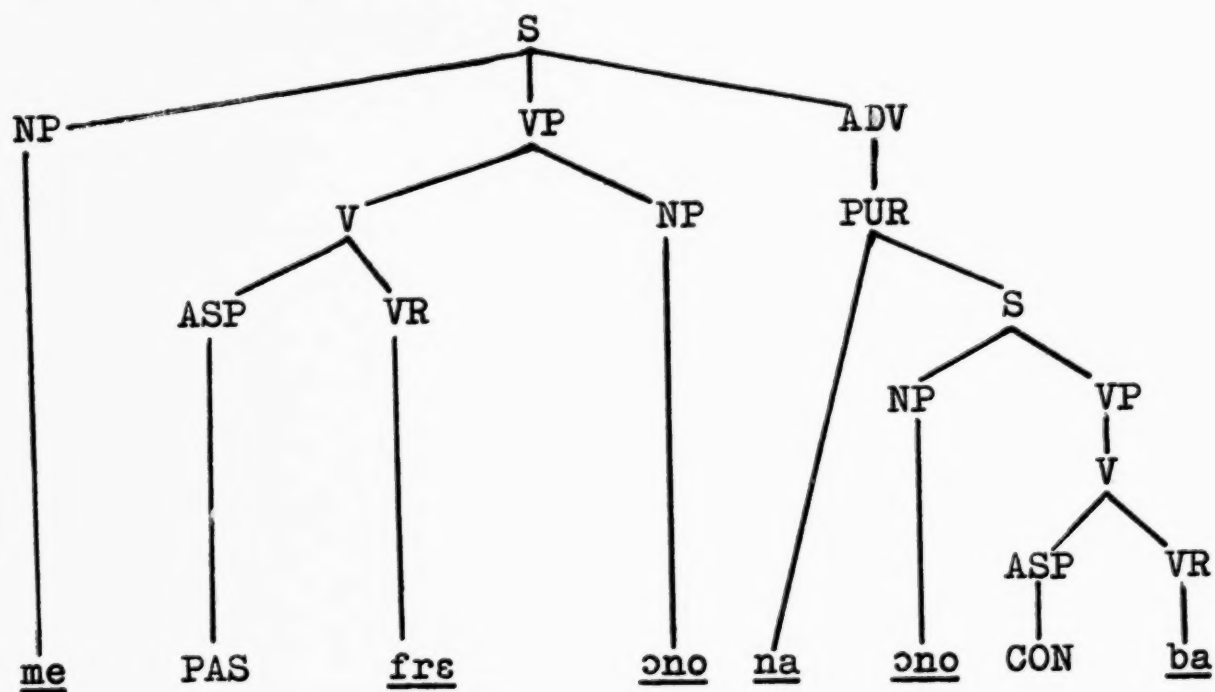
The transformational rule that replaces FUT by CON in purpose clauses has some such form as:

	W	-	PUR	[X - FUT - Y]	PUR	-	Z
SD:	1	-	2	-	3 - 4	-	5
SC:	1	-	2	-	CON - 4	-	5

where $PUR[X - FUT - Y]_{PUR}$ is a purpose clause containing a FUT verb. This rule would, for example, operate on a tree such as:



to yield the derived tree:



which, after certain other operations, would be converted by the phonological component into the sentence Mefre(ε) no na waba.

The systematic-phonemic form of the CON prefix /à/ is identical with that of the PER prefix /à/ which occurs in verbs with perfect-affirmative and past-negative meanings (cf. Section 4.33). The tone patterns of verbs that include CON are, however, in some cases different from those of corresponding verbs that include PER. These differences result from the operation of certain tonal P-rules that apply to verbs that include CON or to verbs that include PER but not to both (cf. Section 4.91).

The two P-rules that affect the segmental forms of verbs that include PER (cf. Section 4.33, subsection (c)), apply equally to verbs that include CON. These are P 42, which operates to change the forms of SC prefixes before /à/, and P 69, the tenseness-harmony rule which, in combination with P 84, operates to change any [a] in a prefix to Ak-As [æ]/Fa [e] if the first vowel of the VR is [+Tense].

4.40 NEGative.

The base rules that generate Akan deep structures permit the optional choice of one NEGative morpheme for every Verb Phrase. In surface structures this morpheme is immediately dominated by V, and occurs immediately after the ASPECT morpheme.

While NEG occurs as a single morpheme in deep structures, its phonetic realization in surface structures typically consists of two or more discontinuous elements: a nasal prefix and one or more transformationally-introduced glottal suffixes. (The occurrence of glottal suffixes as exponents of NEG was first noted by Stewart, 1962, pp. 39-41 et passim.). The systematic-phonemic form of the nasal prefix is /N/: i.e., a [+Nasal, -Tone] segment with other features unspecified. Phonetically it is realized as a nasal consonant homorganic with the consonant that follows it--cf. P 02. The glottal suffixes are introduced by means of a transformation which, given a deep-structure occurrence of NEG, inserts a copy of NEG at one or more other points. These copies of NEG are realized phonetically as glottal stops. The NEG-copying transformation is not presented formally in this text. An informal account of the distribution of glottal suffixes in sentences that include NEG is, however, presented immediately below.

Within a VP that includes NEG, then, a glottal suffix occurs, with certain statable exceptions, after any word that is followed by a pause. Thus a glottal suffix normally occurs after the last word of the VP, before the pause that marks the end of the sentence, as in the following examples:

- Ɔnhwe. [ɔ̀h̥ɕɥé?]
(he-doesn't-look-at)
'He doesn't look at it.'
- Ɔnhwe Kofi. [ɔ̀h̥ɕɥé kòfí?]
(he-doesn't-look-at Kofi)
'He doesn't look at Kofi.'
- Ɔnhwe Kofi pii. [ɔ̀h̥ɕɥé kòfí piì?]
(he-doesn't-look-at Kofi much)
'He doesn't look at Kofi much.'

(Note that in non-negative sentences there is no glottal stop after hwe 'look at', Kofi 'Kofi', or pii 'much'.) If one or more pauses occur within the VP (as a result of replacing word boundaries by phrase boundaries), then a glottal suffix normally occurs after each such pause, as well as at the end of the phrase. Thus, in a slow or emphatic rendering of Ɔnhwe Kofi pii, with pauses inserted after each word, one would get

[ɔ̀h̥ɕɥé? kòfí? piì?]

(When adverbial clauses follow negated verbs, the clauses in some cases show pre-pausal glottal suffixation and in other cases do not. The occurrence or non-occurrence of glottal suffixes may be taken as criterial for whether or not the clauses are constituents of VP. That is, if a clause that follows a negated verb shows glottal suffixation, it is structurally a part of the VP, while if it fails to show glottal suffixation, it is not. More investigation is needed of clause-types that do, and those that do not, show glottal suffixation. The former apparently include clauses introduced by ansa na 'before', kɔpɛm sɛ 'until', and na 'so that'; the latter apparently include clauses introduced by efi(ri) sɛ 'because' and gye sɛ 'unless'. Clauses of this second type may be

called 'sentence adverbials': i.e., they are immediate constituents of S (Sentence) rather than of VP.)

The only cases thus far discovered in which a glottal stop fails to occur after a prepausal word within a VP that includes NEG are the following: (a) when the prepausal word is a negative perfect verb-form; (b) when the prepausal word occurs within a VP that ends in a SUBordinative morpheme (cf. Section 4.81); (c) when the prepausal word occurs within a structure that ends with the interrogative particle /à/. Examples are:

- (a) Ak-As ɔnhwɛ ~ ɔnhwɛɛ [ɔ̀ɲɔwɛ̀ɪ] ~ [ɔ̀ɲɔwɛ̀ɛ]
 Fa ɔnhwɛɛ [ɔ̀ɲɔwɛ̀ɛ]
 (he-hasn't-looked-at)
 'He hasn't looked at it,
 He hasn't looked at....'

(The first form given for Akuapem and Asante is the form that occurs when the verb is not followed by a Noun Phrase; the second form is the one that occurs when a Noun Phrase follows. In Fante, the same form occurs in both contexts.)

- (b) Kofi na ɔnhwɛ. { Ak-Fa [kòfɪ nã ɔ̀ɲɔwɛ̀ɛ]
 As [kòfɪ nã ɔ̀ɲɔwɛ̀ɛ]
 (Kofi EMPH he-doesn't-look-at)
 'It's Kofi who doesn't look at it.'

- (c) Fa ɔnhwɛa? [ɔ̀ɲɔwɛ̀áà]
ɔnhwɛ? [ɔ̀ɲɔwɛ̀ɛɛ]
 (he-doesn't-look-at?)
 'Doesn't he look at it?'

(In Fante, the question particle /à/ is realized phonetically either as [à]--in which case a preceding [ɛ] is assimilated to it--or as a low-tone reduplication of the preceding segment. In Akuapem and Asante it has only the second of these realizations.)

There are two Verb Roots, wɔ /wò/ 'have, be in' and d(z)e /dì/ 'take, use' that have suppletive allomorphs when they occur after NEG. The suppletive allomorph of

wɔ that occurs in this context is /dĩ/ (which is realized phonetically as Ak-As [nĩ], Fa [ɲĩ]); the suppletive allomorph of d(z)e is /fàt/. (/fàt/ occurs as an allomorph of d(z)e in the affirmative imperative as well as in all negative aspects--cf. Section 4.35.) Thus the negative of:

Kofi wɔ sika. 'Kofi has money.'
(Kofi has money)

is:

{	Ak-As	<u>Kofi nni sika.</u>	}	'Kofi doesn't have money.'
	Fa	<u>Kofi nnyi sika.</u> (Kofi doesn't-have money)		

And the negative of:

{	Ak-As	<u>Kofi de ba.</u>	}	'Kofi brings it.'
	Fa	<u>Kofi dze ba.</u> (Kofi takes comes)		

is:

{	Ak-As	<u>Kofi mfa mma.</u>	}	'Kofi doesn't bring it.'
	Fa	<u>Kofi mfa mba.</u> (Kofi doesn't-take doesn't-come)		

The VR d(z)e has unique syntactic, as well as morphological, properties. In those cases in which the occurring allomorph of d(z)e is derived from the fully-specified morphophonemic form /dĩ/--i.e., when the Akuapem-Asante phonetic form is [dĩ] and the Fante phonetic form is [dzĩ]--the verb always occurs in the stative aspect, but is followed by another verb in one of the active aspects: e.g.,

ɔd(z)e beba. 'He will bring it.'
(he-takes will-come)

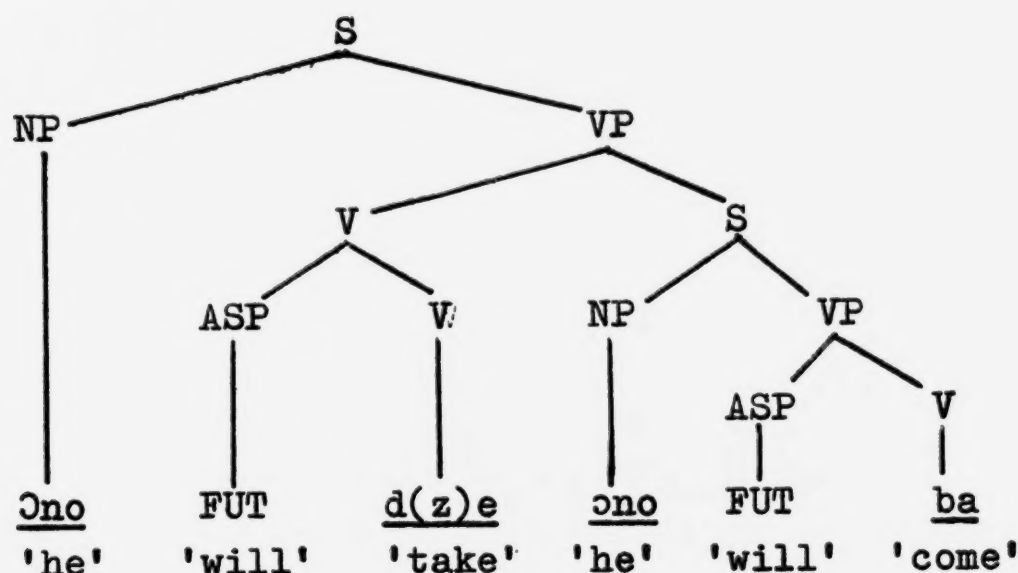
{	Ak-As	<u>ɔde</u> <u>bae</u> .	}	'He brought it.'
	Fa	<u>ɔdze</u> <u>baa</u> . (he-takes came)		

In those cases, however, in which the occurring allomorph is derived from the fully-specified morphophonemic form /fàt/, both the form of /fàt/ and that of the following verb are in one of the active aspects.

{	Ak-As	<u>ɔremfa</u> <u>mma</u> .	}	'He won't bring it.'
	Fa	<u>ɔremfa</u> <u>mba</u> . (he-won't-take won't-come)		

{	Ak-As	<u>Wamfa</u> <u>amma</u> .	}	'He didn't bring it.'
	Fa	<u>Wamfa</u> <u>amba</u> . (he-didn't-take didn't-come)		

The structures illustrated above are all examples of serial-verb constructions, corresponding to deep structures in which d(z)e is followed by an embedded sentence. In all cases of serial-verb structures except those that involve d(z)e as the first verb, there is always agreement in aspect between the two (or more) verbs involved. From this point of view the structures that involve the allomorph of d(z)e derived from /fàt/ are normal cases of serialization, while those that involve the allomorph of d(z)e derived from /dì/ are abnormal. It is therefore suggested here that the STative forms of d(z)e that occur in affirmative sentences are strictly surface-structure forms and that in deep structures d(z)e is a [+ACT], [-STA] verb (cf. Section 4.30), and hence may be inserted only after the active aspects. A sentence like ɔde bae would therefore have as a deep structure something like:



There would then be a transformational rule that replaces the ACT aspect before d(z)e (i.e., FUT in the above example) by STA in the appropriate cases.

4.41 Aspectual Changes in Negative Verbs.

There are fewer distinctive aspect-marked forms of negative verbs than there are of non-negative verbs. That is, certain distinct aspectual meanings that are expressed by different forms in the case of non-negative verbs are expressed by a single form in the case of negative verbs. This collapsing of formal distinctions in negative verbs results from the operation of transformational rules that replace certain ASP morphemes by others in the presence of NEG. Some of these replacements occur in all three dialects; others are restricted to one dialect only. The aspectual changes that occur in all three dialects are: (a) FUT → PRO (i.e., the FUT morpheme is replaced by the PRO morpheme in the presence of NEG); (b) OPT/IMP → HAB; (c) CON → HAB; (d) PAS → PER; (e) PER → PAS. A change that occurs only in Akuapem is: (f) PRO → HAB. A change that occurs only in Fante is: (g) FUT → HAB + INGk (where INGk is the ingressive prefix /kɔ̃/—cf. Section 4.50). These changes are discussed in turn below.

(a) FUT → PRO. The negative future and the negative progressive are homophonous in all three dialects, and the forms that express both negative-future and negative-progressive meanings involve the PRO morpheme /dɪ/

rather than the FUT morpheme /bɛ/ (cf. Sections 4.32 and 4.34). Compare, for example:

<u>orekasa</u>	'he is speaking'
<u>obekasa</u>	'he will speak'

and:

<u>orenkasa</u>	'he isn't speaking, he won't speak'
-----------------	-------------------------------------

The last example, in its future interpretation, results from the operation of a transformational rule that replaces FUT by PRO in the presence of NEG. This rule has some such form as:

	X	-	FUT	-	NEG	-	Y
SD:	1	-	2	-	3	-	4
SC:	1	-	PRO	-	3	-	4

(b) OPT/IMP → HAB. The negative optative and imperative are always formally identical with the negative habitual. The following transformational rule, in which OPT or IMP is replaced by HAB in the presence of NEG, may therefore be proposed:

	X	-	$\begin{Bmatrix} \text{OPT} \\ \text{IMP} \end{Bmatrix}$	-	NEG	-	Y
SD:	1	-	2	-	3	-	4
SC:	1	-	HAB	-	3	-	4

(c) CON → HAB. The negative consecutive, when it occurs in a non-initial verb of a serial-verb construction, is formally identical with the negative habitual. As was noted in Section 4.36, the CON morpheme in this grammatical context is a transformationally-introduced replacement for PRO or FUT. When NEG is present in the verb, a further transformation operates to replace CON itself by HAB:

	X	-	VP	-	CON	-	NEG	-	Y
SD:	1	-	2	-	3	-	4	-	5
SC:	1	-	2	-	HAB	-	4	-	5

The effect of this rule is seen in a sentence such as:

<u>Kofi</u> <u>rensan</u> <u>nkasa</u> .	$\left\{ \begin{array}{l} \text{'Kofi isn't speaking again.'} \\ \text{'Kofi won't speak again.'} \end{array} \right\}$
(Kofi won't-return won't speak)	

in which nkasa (Ak-As [̀̀kàsá?]/Fa [̀̀kásà?]) is formally identical with the negative habitual form that occurs in a sentence such as:

<u>Kofi</u> <u>nsan</u> <u>nkasa</u> .	'Kofi doesn't speak again.'
(Kofi doesn't-return doesn't speak)	

In the other context in which CON occurs--i.e., in purpose clauses--the above transformation does not apply, so that the negative consecutive in this context remains distinct from the negative habitual. Thus in the purpose clause:

<u>na</u> <u>Kofi</u> <u>ankasa</u>	'so that Kofi won't speak'
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The form ankasa includes a reflex of the CON morpheme /à/, and is thus distinct from the negative habitual form nkasa.

(d) PAS → PER and (e) PER → PAS. Unlike the other transformational rules discussed in this section, all of which have the effect of obliterating deep-structure aspectual differences in the presence of NEG (with the result that two aspectually-different deep structures have the same surface-structure realization), the rules presented immediately below do not have this effect. These are the rules, referred to in Section 4.33, which replace PAST by PERFECT, and vice versa, in the presence of NEG. The rules have the form:

	X	-	PAS	-	NEG	-	Y
SD:	1	-	2	-	3	-	4
SC:	1	-	PER	-	3	-	4

	X	-	PER	-	NEG	-	Y
SD:	1	-	2	-	3	-	4
SC:	1	-	PAS	-	3	-	4

Since both rules are obligatory, the distinction between deep-structure negative-past and negative-perfect verb forms is preserved, although in the surface structures a reflex of the PER morpheme is used to express a past meaning while a reflex of the PAS morpheme is used to express a perfect meaning. For examples, cf. Section 4.33.

(f) PRO → HAB. In Akuapem, a negative-progressive meaning may be expressed by a form that is homophonous with the negative habitual. For example, the form ɔnkasa [ɔ̀ŋkàsá?] may, in Akuapem, mean 'he isn't speaking' as well as 'he doesn't speak'. (In Asante and Fante, ɔnkasa--As [ɔ̀ŋkàsá?], Fa [ɔ̀ŋkàsà?]--means only 'he doesn't speak'.) Thus an optional transformation like the following may be proposed for Akuapem:

	X	-	PRO	-	NEG	-	Y
SD:	1	-	2	-	3	-	4
SC:	1	-	HAB	-	3	-	4

(This rule must precede the rule given above which replaces FUT by PRO before NEG, since deep-structure FUT is never expressed by HAB.)

(g) FUT → HAB + INGk. Fante shares with the other two dialects the rule presented above, in which FUT is replaced by PRO in the presence of NEG. In Fante, however, there is also an alternative transformational rule that may apply to a deep-structure sequence consisting of FUT and NEG. In this transformation FUT is replaced by HAB rather than PRO, and the INGressive prefix /kɔ́/ (symbolized as INGk--cf. Section 4.50) is inserted after NEG. The rule thus has the form:

	X	-	FUT	-	NEG	-	Y
SD:	1	-	2	-	3	-	4
SC:	1	-	HAB	-	3+INGk	-	4

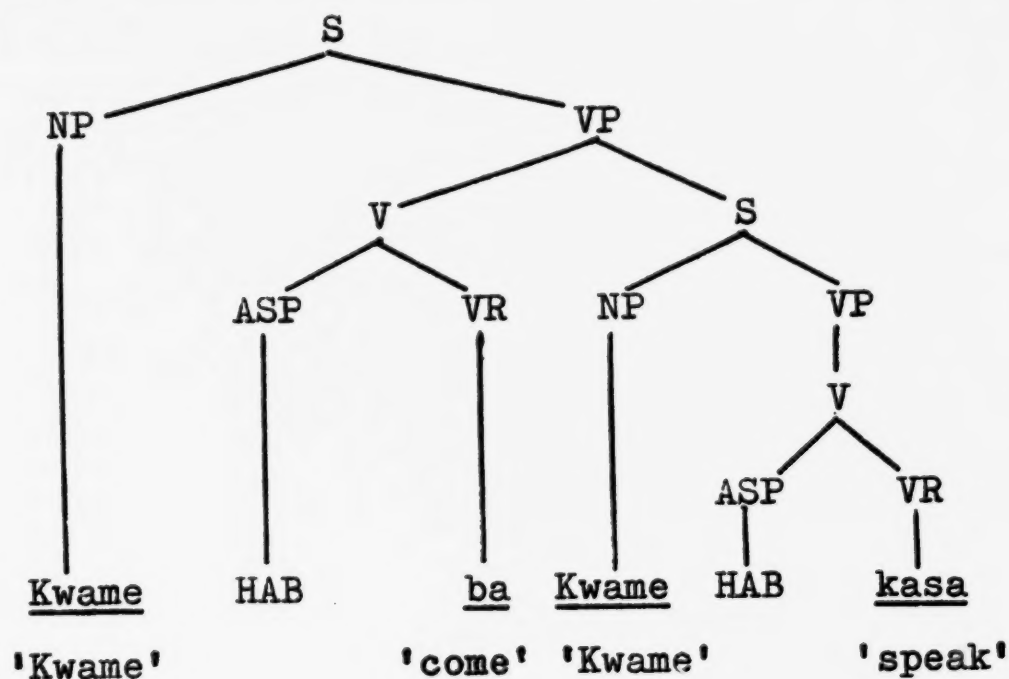
The products of this rule are homophonous with the negative habitual ingressive formed with /kɔ́/. For example, the Fante form ɔnkekasa may mean either 'he won't speak' or 'he doesn't go to speak'. (The [ɛ] of the ingressive prefix in ɔnkekasa results from the operation of the Fante backness-harmony rule, P 78.) Fante, then, has two

negative future forms: one homophonous with the negative progressive, the other homophonous with the negative habitual ingressive formed with /kɔ́/. The second of these negative-future formations does not occur in Akuapem or Asante.

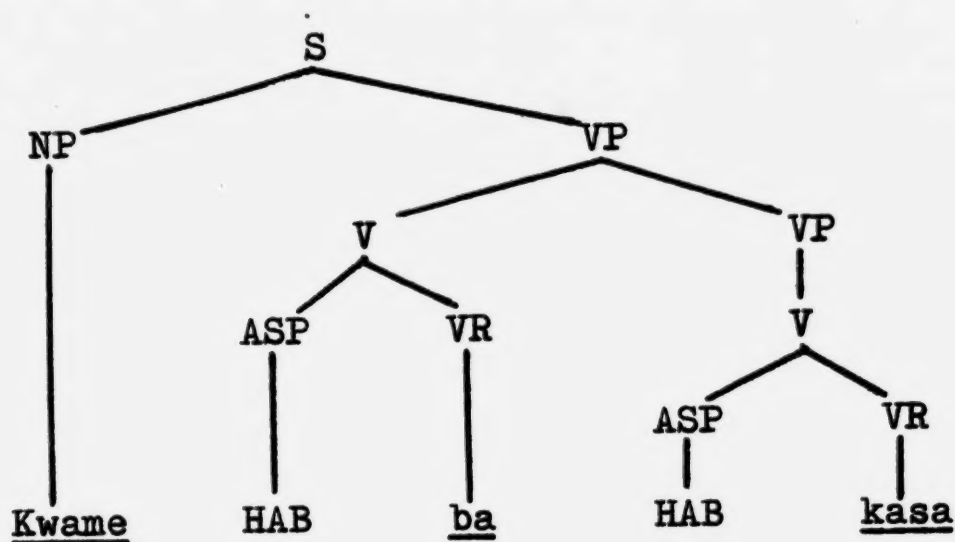
4.50 INGressive.

There are two INGressive prefixes, one having the meaning 'come (in order) to...' or 'come and ...', the other having the meaning 'go (in order) to ...' or 'go and ...'. Their fully-specified morphophonemic forms are, respectively, /bɛ/ and /kɔ́/.

The ING prefixes do not occur in deep structures. They are introduced into surface structures by means of transformations that operate upon sentences with serial-verb constructions consisting of a VP whose VR is ba /bá/ 'come' or kɔ(r(e)) /kɔ́/ 'go' plus another VP. (The notation kɔ(r(e)) for the VR 'go' indicates dialectal variation--cf. Sections 4.72 and 4.73.) These serial-verb constructions themselves are transformationally derived from deep structures in which sentential complements follow VPs that include ba or kɔ(r(e)). Thus, starting from a deep structure such as:



the serial-verb transformation operates to produce the derived tree:

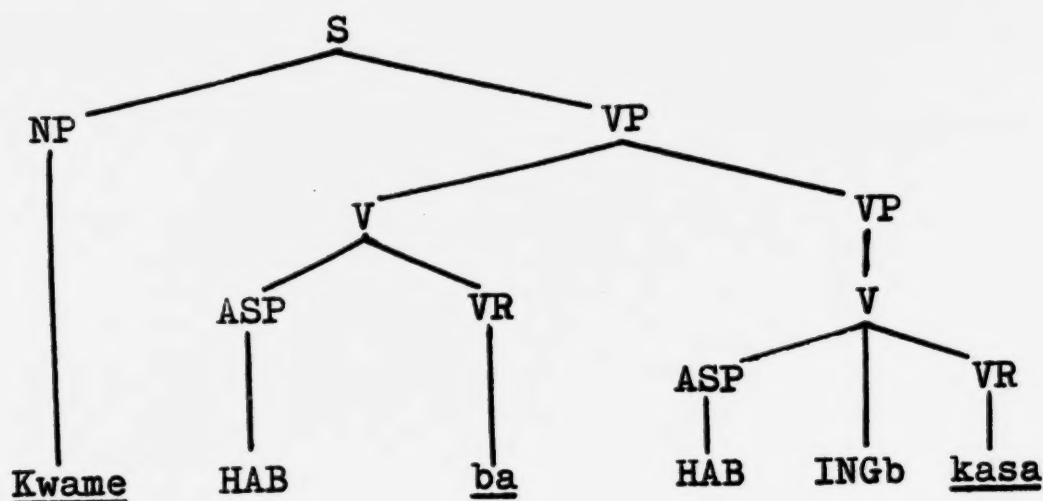


This structure, in turn, undergoes a transformation that inserts the ING prefix /bɛ/ before the VR of the VP that follows ba. (The ING prefix /bɛ/ will be symbolized here as INGb. The ING prefix /kɔ/, which is transformationally inserted before the VR of a VP that follows ko(r(e)) will be symbolized as INGk.)

The transformational rule that inserts the ING prefixes has some such form as:

$$\begin{array}{l}
 X - \left[\begin{array}{c} \text{ba} \\ \text{ko(r(e))} \end{array} \right] - Y - \text{ASP (NEG) - (RED) VR - Z} \\
 \text{SD: } 1 - 2 - 3 - 4 - 5 - 6 \\
 \text{SC: } 1 - 2 - 3 - 4 + \left[\begin{array}{c} \text{INGb} \\ \text{INGk} \end{array} \right] - 5 - 6
 \end{array}$$

This rule operates, for example, upon the derived tree just presented to produce the tree:



And this tree, after appropriate specification of the ASP and ING morphemes, is converted by the phonological component into the sentence:

Kwame ba bekasa. 'Kwame comes to speak.'

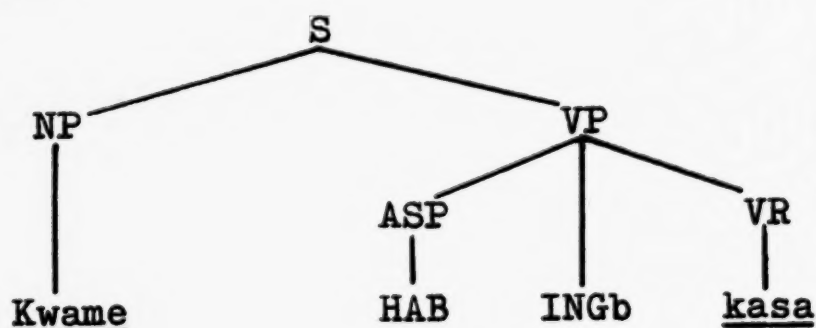
In cases like the above, where nothing intervenes between ba (or ko(r(e))) and the verb that has the ING prefix, and where ASP does not equal FUT, a further, optional, transformation may operate to delete the V whose VR is ba (or ko(r(e))) itself. This transformation has the form:

$$X - \text{ASP (NEG)} - \left[\begin{array}{c} \text{ba} \\ \text{ko(r(e))} \end{array} \right] - \text{ASP (NEG)} \left[\begin{array}{c} \text{INGb} \\ \text{INGk} \end{array} \right] - Y$$

SD:	1 -	2	-	3	-	4	-	5
SC:	1 -	∅	-	∅	-	4	-	5

Condition: 2 ≠ FUT

If applied to the last tree presented, this transformation yields the tree:



The sentence that corresponds to this tree is:

Kwame bekasa. 'Kwame comes to speak.'

Note that, as the transformation is stated, the deleted ba or ko(r(e)) must immediately precede the verb that includes the ING prefix. Thus, for example, ba cannot be deleted from the structure that underlies the sentence:

Kwame ba Kumase bekasa. 'Kwame comes to Kumase to speak.'

(There is no *Kwame Kumase bekasa.) The condition on the transformation to the effect that the element immediately preceding ba or ko(r(e)) is not FUT is intended to block, for example, the deletion of beba from the structure that underlies the sentence:

Kwame beba abekasa. 'Kwame will come to speak.'

(There is no *Kwame abekasa in the meaning 'Kwame will come to speak' and there is no *Kwame bebekasa. The a- of abekasa is the realization of the CON morpheme that obligatorily replaces FUT in non-initial verbs of serial-verb constructions--cf. Section 4.36.) It should be noted, however, that the deletion of the sequence FUT + NEG + ba/ko(r(e)) is permitted by the rule. Thus the rule can operate upon the structure underlying, e.g.:

{	Ak-As	<u>Kwame</u> <u>remma</u> <u>mmekasa</u> .	} 'Kwame won't come to speak.'
{	Fa	<u>Kwame</u> <u>remba</u> <u>mbekasa</u> .	

to produce the structure underlying:

{	Ak-As	<u>Kwame</u> <u>remmekasa</u> .	} 'Kwame won't come to speak.'
{	Fa	<u>Kwame</u> <u>rembekasa</u> .	

(The initial /b/s of /bá/ and /bé/ undergo assimilation to a preceding nasal in Akuapem and Asante--cf. P 72. The forms with re result from the transformation presented in Section 4.41, in which PRO replaces FUT in the presence of NEG. Note that the transformation that replaces FUT by CON in non-initial serial verbs (cf. Section 4.36) fails to apply in cases like the last example cited. This means that the rule deleting Vs whose VRs are ba or ko(r(e)) precedes the rule that replaces FUT by CON. Given this ordering, the verb in the last example is not part of a serial-verb construction at the point in the rules at which the FUT → CON rule would apply, so the replacement of FUT by CON fails to occur.)

As was noted in Section 4.34, Christaller identified the combination of PRO and ING_b as a distinct aspect, the

'second future'. It is certainly the case that a form such as ɔreɓekasa may carry a future meaning, 'he is about to speak', as well as a progressive-ingressive meaning, 'he is coming to speak'. It seems to us, however, that this meaning may simply be assigned, by the semantic component of the grammar, as a possible reading of the deep structure underlying the sequence PRO + ING_b, without setting up a distinct second-future ASP morpheme. (The sequence PRO + ING_b allows of the 'second-future' interpretation only in the affirmative. Thus the negative forms Ak-As ɔremmekasa/Fa ɔremɓekasa can not mean 'he isn't about to speak' but only 'he isn't coming to speak' or--in cases where re is a replacement for a deep-structure FUT--'he won't come to speak'. For further discussion of the 'second future', see Dolphyne, p. 37, which takes issue with the view adopted here.)

In all three dialects the vowels of the surface forms of the ING prefixes vary in accordance with the P-rule of tenseness harmony (P 69). In Fante, the vowels of the prefixes also vary in accordance with the Fante P-rule of backness harmony (P 78). The segmental forms of ING_b that occur in Akuapem and Asante are [ɓɛ] and [ɓe]; Fante shows, additionally, the forms [ɓɔ] and [ɓo]. The segmental forms of ING_k that occur in Akuapem and Asante are [kɔ] and [ko]; Fante shows, additionally, the forms [kɛ] and [ke]. Examples are:

	<u>ɔɓɛɣɛ</u>	'he comes to do'
	<u>ɔɓɛɣi</u>	'he comes to remove'
Fa	<u>ɔɓɔtɔ</u>	'he comes to buy'
(cf. Ak-As	<u>ɔɓɛtɔ</u>	'he comes to buy')
Fa	<u>ɔɓɔtu</u>	'he comes to dig'
(cf. Ak-As	<u>ɔɓɛtu</u>	'he comes to dig')
	<u>ɔkɔtɔ</u>	'he goes to buy'
	<u>ɔkɔtu</u>	'he goes to dig'
Fa	<u>ɔkɛɣɛ</u>	'he goes to do'
(cf. Ak-As	<u>ɔkɔɣɛ</u>	'he goes to do')
Fa	<u>ɔkɛɣi</u>	'he goes to remove'
(cf. Ak-As	<u>ɔkɔɣi</u>	'he goes to remove')

In Akuapem and Asante, the underlying high tone on the ING prefixes is changed to low by means of P 47. Compare, for example, the surface tone patterns of Ak-As [òbèjé]/Fa [òbéjé] 'he comes to do'. While the surface tone of ING itself is low in Akuapem and Asante, certain other surface tonal phenomena in these dialects give evidence of the underlying high tone of ING. For example, there is an Akuapem-Asante rule, P 20, which changes an underlying high-low tone pattern on a disyllabic VR to low-high in Akuapem, low-falling in Asante except when the VR immediately follows a high-tone prefix. (The rule thus changes, e.g., [òbísà] 'he asks' to Ak [òbísá]/As [òbísâ].) The fact that P 20 fails to apply to ING forms (cf. the surface tone pattern of Ak-As [òbèbísà nũ] 'he comes to ask him') indicates that at the point in the rules at which P 20 applies, the ING prefix still has high tone.

4.60 REDuplication.

Reduplicating affixes that are constituents of Verbs are in most cases introduced into deep structure through the exercise of an optional choice in the base rule for rewriting V (Verb). This rule has some such form as: $V \rightarrow \text{ASP (NEG) (RED*) VR}$, where the parentheses around (RED*) indicate that the reduplicating affix is optional, and where the asterisk indicates that RED may be repeated an indefinite number of times (as in okasakasakasaka-kasakasa... 'he talks and talks and talks and talks and talks and talks...'). When RED is introduced by means of an optional choice in the base rules, it adds a meaning of 'multiple activity' (or, in the case of stative verbs, 'multiple state') to the meaning of the VR. The multiple character of the activity may involve its being performed by more than one actor, its being performed upon more than one object, and/or its being performed more than one time. In general, the more often RED is repeated, the greater the number of actors, objects, and/or repetitions implied.

In a small number of cases, RED is introduced into deep structures from the lexicon, where it occurs as part of a VR. That is, there are a few VRs which have the internal structure: $\text{RED} + \text{VR}^1$ (where VR^1 is itself, for the purposes of phonological rules, a VR). In such cases,

neither RED nor VR¹ has any independent meaning, although VR¹ usually has some semantic relation to a homophonous VR that is listed in the lexicon without an obligatory RED component. Compare: d(z)id(z)i 'eat (intransitive)' and d(z)i 'eat (transitive)' (where the spellings with and without z represent the Fante and Akuapem-Asante forms respectively), hwehwe 'look for' and hwe 'look at', siesie 'arrange' and sie 'put'. (There is at least one VR of the RED + VR¹ type, sesa 'change', whose VR¹ is not homophonous with a semantically related VR. This verb must nevertheless be analyzed as a reduplicated monosyllabic VR, rather than as a disyllabic VR, on tonal grounds. Compare, for example, the tones, in Fante, of òsèsá 'he changes' and òkásà 'he speaks'--where kasa is an ordinary disyllabic VR.) The RED* that is introduced as an optional constituent of V may co-occur with a VR which itself includes RED. This accounts for forms such as od(z)id(z)id(z)id(z)i 'he eats and eats' or ohwehwehwehwe 'he looks and looks for'.

The precise form of RED in any given case is specified by P-rules. The rules themselves are presented in the Appendix. An informal account of the operation of these rules is given in the sections that immediately follow the present section. Section 4.61 discusses the general rule of monosyllabic RED; Section 4.62, subsidiary rules affecting monosyllabic RED; Section 4.63, the general rule of disyllabic RED; and Section 4.64, subsidiary rules affecting disyllabic RED.

4.61 General Rule of Monosyllabic RED.

The general rule of monosyllabic reduplication (P 21) applies to a RED prefix that immediately precedes a monosyllabic VR (or VR¹). The rule operates to replace the RED symbol by a syllable that is identical with the following VR (or, more specifically, identical with the representation of the VR at the point in the P-rules at which the rule of monosyllabic reduplication applies), except that: (a) the tongue-height features, High and Low, of the vowel of VR are not copied in RED, but are instead specified as [+High] and [-Low] in all cases; (b) in certain specifiable cases, a nasalized (i.e., [+Nasal]) vowel in VR has a non-nasalized counterpart in RED; (c) when VR has a final [-Nasal] non-vowel, this non-vowel does not appear in RED; (d) whatever the inherent tone of

the VR, RED has low tone and the VR that follows it has high tone. These differences between RED and the following monosyllabic VR are discussed in turn below. Then, under (e), there is a discussion of the ordering of the monosyllabic-RED rule in relation to the palatalization rule, P 11.

(a) Whatever the tongue height of the vowel of VR, its reflex in RED is always a close--i.e., [+High, -Low]--vowel. This close vowel always agrees with the vowel of VR in tenseness. That is, if the vowel of VR is [+Tense], then RED has a [+Tense] vowel, while if the vowel of VR is [-Tense], RED has a [-Tense] vowel. The vowel of RED normally also agrees with the vowel of VR with respect to frontness or backness; i.e., with respect to the feature [±Back]. (Exceptions to this generalization are accounted for by the operation of a subsequent P-rule--cf. Section 4.62, subsection (a).) Thus if the vowel of VR is [+Back] (i.e., is [U] or [O]), the vowel of RED is also [+Back], while if the vowel of VR is [-Back] (i.e., is [I], [E], or [A]), so, normally, is the vowel of RED. Examples (with tone ignored) are:

<u>VR</u>			<u>RED + VR</u>		
	<u>si</u>	[siʔ]	'stand'	<u>sisi</u>	[sisiʔ]
	<u>fe</u>	[fiʔ]	'vomit'	<u>fefe</u>	[fifiʔ]
Ak	<u>se</u>	[seʔ]	'say'	<u>sise</u>	[siseʔ]
	<u>sɛ</u>	[sɛʔ]	'resemble'	<u>sɛsɛ</u>	[sɛsɛʔ]
	<u>sa</u>	[saʔ]	'cure'	<u>sesa</u>	[sisaʔ]
	<u>twa</u>	[tɕɥeʔ]	'cut'	<u>twitwa</u>	[tɕɥitɕɥeʔ]
	<u>bu</u>	[bu(?)]	'bend'	<u>bubu</u>	[bubu(?)]
	<u>so</u>	[su(?)]	'carry on the head'	<u>soso</u>	[susu(?)]
Ak	<u>so</u>	[soʔ]	'seize'	<u>suso</u>	[susoʔ]
	<u>sɔ</u>	[sɔʔ]	'light'	<u>sosɔ</u>	[susɔʔ]

(Forms with a final glottal stop in parentheses show dialect variation, the glottal stop occurring in some dialects but not in others. For details, cf. Section 4.79.)

(b) When the vowel of VR is [ĩ], [ĩ̃], [ũ], or [ũ̃], the [+Nasal] feature of this vowel is also normally found in the vowel of RED. Thus:

<u>VR</u>			<u>RED + VR</u>	
<u>ti</u>	[tĩ?]	'scratch'	<u>titi</u>	[tĩtĩ?]
<u>se</u>	[sĩ(?)]	'hang on'	<u>sese</u>	[sĩsĩ(?)]
<u>su</u>	[sũ]	'cry'	<u>susu</u>	[sũsũ]
<u>to</u>	[tũ(?)]	'twist'	<u>toto</u>	[tũtũ(?)]

But when the vowel of VR is [ã], the retention of the [+Nasal] feature in the vowel of RED depends upon whether the initial consonant of VR is [+Nasal] or [-Nasal]. If this consonant is [+Nasal], then the vowel of RED is [+Nasal]. Thus:

<u>VR</u>			<u>RED + VR</u>	
<u>ma</u>	[mã(?)]	'give'	<u>mema</u>	[mĩmã(?)]
<u>nam</u>	[nãm?]	'walk'	<u>nenam</u>	[nĩnãm?]

If, however, this consonant is [-Nasal], then the vowel of RED is normally [-Nasal]. Thus:

<u>VR</u>			<u>RED + VR</u>	
<u>ka</u>	[kã(?)]	'say'	<u>keka</u>	[kĩkã(?)]
<u>sa</u>	[sã?]	'tie up'	<u>sesa</u>	[sĩsã?]

(For some speakers, and in the case of certain specific items, nasalization of the vowel of RED is optional when the vowel of VR is [+Nasal] and the initial consonant is [-Nasal]. Thus speakers are found for whom [tutũ(?)], as well as [tũtũ(?)], is acceptable as a reduplication of [tũ(?)], and for whom [sĩsã?], as well as [sisã?], is acceptable as a reduplication of [sã?]. As far as we have been able to determine, however, the only forms that are acceptable to all speakers are those that are in accordance with the generalizations previously made.)

(In certain cases, the vowel of RED, although it is [-Nasal] after the operation of the rule under discussion, may become [+Nasal] through the operation of a subsequent

P-rule. Thus the reduplicated form of pam [pām?] 'meet' is [pĩmpām?]. In this case, the present rule operates to produce a non-nasalized vowel in RED, and this vowel is nasalized by a later P-rule, P 74, which nasalizes all close vowels that precede nasal consonants in the same syllable. The fact that the nasalization of the close vowel in [pĩmpām?] does not result from the operation of the monosyllabic-RED rule becomes obvious if we compare it with the reduplicated form of pam [pam?] 'sew', which is [pĩmpam?]. In the latter case, the close vowel of RED is nasalized even though the vowel of VR is itself [-Nasal].)

(c) In the case of those VRs which, at the point of application of the monosyllabic-RED rule, have a final [-Nasal] non-vowel, this non-vowel is not copied in the formation of RED. The final non-vowels that are thus dropped in the formation of RED are [w], [r], and [ʔ]. (Final [w], which corresponds to an underlying final /p/, is found in surface forms only in Akuapem and in some Fante subdialects. Final [r], which corresponds to an underlying final /t/, is found in surface forms only in Fante. Final [ʔ], which in many cases corresponds to an underlying final /k/, is found in all dialects, but only in pre-pause position. It should be noted that, in the surface forms of VRs followed immediately by pause, a 'final [w]' or 'final [r]' is actually pre-final, since it is followed by a glottal stop in this position. It should also be noted that the Akuapem and Asante surface forms that correspond to Fante surface forms with final [r] often show [r] plus vowel (plus, in the case of Akuapem, a glottal stop). The P-rules that account for these surface characteristics are summarized in Section 4.79.) Some examples are:

<u>VR</u>			<u>RED + VR</u>		
{ Ak-Fa ¹	<u>haw</u>	[haw?]	'trouble'	{ <u>hehaw</u>	[hihaw?]
	<u>ha</u>	[ha?]			
{ As-Fa ²	<u>haw</u>	[haw?]	'catch'	{ <u>sosow</u>	[susow?]
	<u>so</u>	[so?]			
{ Fa	<u>bar</u>	[bar?]	'cover'	{ <u>bebar</u>	[biibar?]
	<u>bare</u>	[bari(?)]			

<u>VR</u>			<u>RED + VR</u>		
{ Fa	<u>hor</u>	[hur?]	'wash'	<u>hohor</u>	[huhur?]
	Ak-As <u>horo</u>	[huru(?)]		<u>hohoro</u>	[huhuru(?)]
{ Fa	<u>far</u>	[far?]	'take'	<u>fefar</u>	[fifar?]
	Ak-As <u>fa</u>	[fa?]		<u>feffa</u>	[fifa?]
	<u>pa</u>	[pa?]	'remove'	<u>pepa</u>	[pipa?]
	<u>si</u>	[si?]	'stand'	<u>sisi</u>	[sisi?]

(Fa¹ and Fa² represent subdialects of Fante: respectively, those in which final [w] is retained, and those in which it is not.)

In the case of those VRs which, at the point of application of the monosyllabic-RED rule, have a final [+Nasal] consonant--i.e., an [m], [n], or [ŋ]--this consonant, unlike the [-Nasal] non-vowels just discussed, is copied in the formation of RED. (Subsequent rules may, however, apply to change the point of articulation of the final nasal consonant of RED and/or to delete it.) Some examples are:

<u>VR</u>			<u>RED + VR</u>		
	<u>fem</u>	[fem?]	'lend'	<u>femfem</u>	[fɛmfem?]
{ Fa	<u>ton</u>	[tũn?]	'forge'	<u>tonton</u>	[tũntun?]
	Ak-As <u>tono</u>	[tunũ(?)]		<u>tontono</u>	[tũntunũ(?)]
	<u>kan</u>	{ [Ak kan?] [As kaĩ] [Fa kan?]	'count'	<u>kenkan</u>	{ [Ak kĩŋkan?] [As kĩŋkaĩ] [Fa kĩŋkan?]

(The o [ũ] at the end of Ak-As tono is accounted for by the operation of a P-rule--cf. Section 4.73. For an explanation of the variant pronunciations of kan, cf. Section 4.74.)

(d) Monosyllabic RED is always inserted with low tone, although this tone may be replaced by high tone through the operation of subsequent P-rules. In Akuapem, the tone pattern of a sequence consisting of RED plus a monosyllabic VR--e.g., hwehwɛ 'look for'--is always identical with that of a disyllabic VR whose second syllable begins with a voiceless consonant--e.g., bisa 'ask'. Thus:

Ak Mèhwèhwé nò. 'I look for him.'
 Ak Mìbisá nò. 'I ask him.'

This is also true in Asante, but in Asante, as opposed to Akuapem, certain other sentence elements, such as object pronouns, may show different tonal behavior with RED-plus-monosyllabic-VR verbs from what they show with verbs involving disyllabic VRs. For example:

As Mèhwèhwé nó. 'I look for him.'
 As Mìbisá nò. 'I ask him.'

In Fante, the tones of RED-plus-monosyllabic-VR verbs and verbs with disyllabic VRs are usually different: e.g.,

Fa Mèhwèhwé nò. 'I look for him.'
 Fa Mìbisà nò. 'I ask him.'

(For a discussion of the tone patterns of disyllabic VRs, cf. Section 4.75.)

The distinction between low-tone and high-tone monosyllabic VRs (which is well-attested in Fante, less well-attested in Asante, and completely absent in Akuapem--cf. Section 4.71) is lost when the VR is preceded by RED. Thus a low-tone VR like da 'sleep' and a high-tone VR like ba 'give' show the same tone patterns in their reduplicated forms. Compare:

	<u>Non-reduplicated</u>		<u>Reduplicated</u>
Fa	<u>wòndà</u>	'they aren't sleeping'	<u>wòndèdà</u>
Fa	<u>wòm̀bà</u>	'they aren't coming'	<u>wòm̀bèbà</u>

(e) The monosyllabic-RED rule follows many of the P-rules that affect the shape of the VR. In particular, it is important to note that it follows the rule of palatalization, P 11. Thus if the initial non-vowel of the VR is palatalized, so is its counterpart in RED, and if the initial non-vowel of the VR is not palatalized, neither is its counterpart in RED. Some examples illustrating this point are:

	<u>VR</u>		<u>RED + VR</u>
	<u>gya</u> [dʒəʔ]	'accompany'	<u>gyigya</u> [dʒidʒəʔ]
	<u>hye</u> [çɪʔ]	'burn'	<u>hyehye</u> [çɪçɪʔ]
Ak-Fa ¹	<u>haw</u> [hawʔ]	'trouble'	<u>hehaw</u> [hɪhawʔ]
As-Fa ²	<u>ha</u> [haʔ]		<u>heha</u> [hɪhaʔ]
	<u>kys</u> [tʃs(?)]	'divide'	<u>kyekys</u> [tʃɪtʃs(?)]
	<u>ka</u> [kaʔ]	'bite'	<u>keka</u> [kɪkaʔ]
	<u>twa</u> [tʃwəʔ]	'cut'	<u>twitwa</u> [tʃɪtʃwəʔ]

The ordering of the monosyllabic-RED rule after the palatalization rule accounts for the occurrence in surface forms of RED of certain sequences that do not occur in monosyllables of other types. Thus [hɪ] and [kɪ] do not occur in the surface forms of monosyllabic roots, since [h] in a root is always palatalized before a [-Nasal] non-low front vowel while a [k] in a root is always palatalized before any non-low front vowel.

4.62 Subsidiary Rules Affecting Monosyllabic RED.

After the general rule of monosyllabic reduplication has applied, the shape of RED which it specifies is in some cases altered by the application of other P-rules. In this section three such P-rules are discussed: (a) the monosyllabic-RED [ɪ] → [U] rule, P 22; (b) the homorganic-nasal rule, P 25; (c) the nasal-deletion rule, P 26. The discussion of these rules is followed by a discussion of a P-rule that may alter the shape of a VR that follows monosyllabic RED: (d) the progressive voiced non-vowel nasalization rule, P 72.

(a) The general rule of monosyllabic reduplication specifies that the close vowel occurring in RED agrees with the vowel of VR with respect to the feature [$\pm$ Back]. Thus if the vowel of VR is [A], which is [-Back], the rule specifies that the vowel of RED should be the [-Back] close vowel [I]. There are, however, certain cases in which [U], rather than [I], occurs in RED before a VR whose vowel is [A]. These cases reflect the operation of a P-rule, P 22, which changes an [I] in RED to [U] under certain circumstances: viz., when the vowel of VR is [A], and the initial non-vowel of VR (and hence of RED) has certain features in common with [U].

Three classes of initial non-vowels may trigger the change of [I] to [U] in RED (when the vowel of VR is [A]). These classes are: [+Round, -Palatal], [+Round, +Coronal], and [-Round, -Coronal]. In the case of the [+Round, -Palatal] non-vowels (where both of the mentioned feature-specifications are shared by [U]), the change of [I] to [U] is obligatory in most dialects, but optional in some Fante subdialects. Examples of the operation of the rule when the initial non-vowel is [+Round, -Palatal] are:

<u>Before [I] → [U]</u>			<u>After [I] → [U]</u>
Ak-Fa ¹	[fwifwəwʔ]	'chip'	[f(w)ufwəwʔ]
Fa ²	[fwifwəʔ]		[f(w)ufwəʔ]
Ak-Fa	[gwigwəʔ]	'skin'	[g(w)ugwəʔ]
(cf. As	[dɟɪdɟɪʔ]	'skin')	
Ak-Fa	[h̃wih̃wəʔ]	'scrape'	[h̃(w)ũhwəʔ]
(cf. As	[čɣičɣiʔ]	'scrape')	
Ak-Fa ¹	[kwikwawʔ]	'rub off'	[k(w)ukwawʔ]
As-Fa ²	[kwikwaʔ]		[k(w)ukwaʔ]
	[swiswəʔ]	'be small'	[s(w)uswəʔ]
Ak-As	[wiwari(?)]	'be tall'	[wuwari(?)]
Fa	[wiwarʔ]		[wuwarʔ]

(The parenthesized '(w)'s in transcriptions in the right-hand column represent a notational variation only. The initial consonants are labialized in all cases, but it is the usual practice in phonetic transcription in this text not to indicate labialization of consonants before rounded vowels.)

Some explanation of certain of the above examples may be in order. At the point in the operation of the P-rules at which the monosyllabic-RED rule applies, the [+Round, -Palatal] non-vowels [fw], [gw], and [hw] occur before [A] in Akuapem and Fante but not in Asante. In the case of [fwA], the sequence is attested in only a few Akuapem-Fante items which apparently have no Asante counterparts. In the case of [gwA] and [hwA], the situation is more complex. The underlying forms of the VRs for 'skin' and 'scrape' are, respectively, /guək/ and /hũɛk/. In all three dialects, /guək/ → [guəʔ] (by P 03), and /hũɛk/ → [hũɛʔ] (by P 03) → [hũɛʔ] (by P 06). In Akuapem and Fante, the forms [guəʔ] and [hũɛʔ] undergo, before the application of the monosyllabic-RED rule, only labialization (P 09) and [U]-deletion (P 10). Thus in these dialects, [guəʔ] → [gwuəʔ] → [gwəʔ], and [hũɛʔ] → [hũwɛʔ] → [hũwəʔ]. In Asante, however, the Asante [I]-insertion rule (P 07) applies to [guəʔ] and [hũɛʔ], yielding [guɪəʔ] and [hũɪɛʔ]. Thereafter, these forms undergo not only labialization and [U]-deletion but also palatalization and [I]-deletion (respectively, P 11 and P 13). Thus As [guɪəʔ] → [gwuɪəʔ] → [gwiəʔ] → [dʒuɪəʔ] → [dʒuəʔ], and As [hũɪɛʔ] → [hũwɪɛʔ] → [hũwiəʔ] → [tɕuɪəʔ] → [tɕuəʔ]. The forms to which the monosyllabic-RED rule applies are therefore [gwəʔ] and [hũwəʔ] in Akuapem and Fante, [dʒuəʔ] and [tɕuəʔ] in Asante, and the resultant reduplicated forms are Ak-Fa [gwigwəʔ] and [hũwi hũwəʔ], As [dʒuɪdʒuəʔ] and [tɕuɪtɕuəʔ]. Since the Akuapem-Fante forms begin with [+Round, -Palatal] non-vowels, the [I] → [U] rule obligatorily applies to them. The Asante forms, on the other hand, begin with [+Round, +Palatal] non-vowels, and the [I] → [U] rule does not apply in such cases in Asante (see below). The development of deep-structure RED + /guək/ and RED + /hũɛk/ in the different dialects is summarized below:

	<u>Ak-Fa</u>	<u>As</u>	<u>Ak-Fa</u>	<u>As</u>
Underlying form	RED + guek	RED + guek	RED + hũək	RED + hũək
/k/ → [ʔ]	RED + gueʔ	RED + gueʔ	RED + hũəʔ	RED + hũəʔ
Nasalization			RED + hũ̃ə	RED + hũ̃ə
Asante [ɪ] insertion		RED + guieʔ		RED + hũ̃iəʔ
Labialization	RED + gwueʔ	RED + gwuieʔ	RED + h̃wũəʔ	RED + h̃wũiəʔ
[U] deletion	RED + gweʔ	RED + gwieʔ	RED + h̃wəʔ	RED + h̃wiəʔ
Palatalization		RED + d̤jueʔ		RED + ɕ̤j̃iəʔ
[ɪ] deletion		RED + d̤jueʔ		RED + ɕ̤j̃əʔ
Monosyllabic RED	gwigweʔ	d̤j̤ɪd̤j̤ueʔ	h̃wĩh̃wəʔ	ɕ̤j̃ĩɕ̤j̃əʔ
[ɪ] → [U]	g(w)ugweʔ		h̃(w)ũ̃h̃wəʔ	

In the case of the [+Round,+Coronal] and [-Round,-Coronal] initial non-vowels (where [+Round] and [-Coronal] are the features shared with [U]), the change of [I] to [U] in RED is never obligatory, and occurs (optionally) only in Akuapem and Fante. Since the application of P 22 is optional, the forms that result from its operation vary freely with the forms that result when it is not applied. In the examples of surface forms shown below, the first form of each verb that appears in the right-hand column is the form that results if P 22 has not applied, the second the form that results if it has.

<u>VR</u>			<u>RED + VR</u>
<u>pa</u>	[paʔ]	'remove'	[pɪpaʔ] ~ [pupaʔ]
<u>ba</u>	[ba]	'come'	[bɪba] ~ [buba]
<u>ma</u>	[mãʔ]	'give'	[mĩmãʔ] ~ [mũmãʔ]
<u>fa</u>	[faʔ]	'take'	[fɪfaʔ] ~ [fufaʔ]
<u>ka</u>	[kaʔ]	'bite'	[kɪkaʔ] ~ [kukaʔ]
<u>haw</u>	[ha(w)ʔ]	'trouble'	[hɪha(w)ʔ] ~ [huha(w)ʔ]
<u>twa</u>	[tɕyɛʔ]	'cut'	[tɕyɪtɕyɛʔ] ~ [tɕyutɕyɛʔ]
<u>dwa</u>	[dʒyɛʔ]	'report'	[dʒyɪdʒyɛʔ] ~ [dʒudʒyɛʔ]

For some Akuapem and Fante speakers, certain verbs which otherwise meet the requirements for the optional application of P 22 are specifically marked as being exempt from the application of the rule. Some speakers, for example, have only [kɪkãʔ], and not [kukãʔ], as the reduplicated form of [kãʔ] 'say'.

(b) As is noted in Section 4.61, subsection (c), if VR ends in a nasal consonant, this consonant is copied in the formation of monosyllabic RED. In such cases, a subsequent rule (P 25) applies, obligatorily in some dialects, optionally in others, to make the final nasal consonant of RED homorganic with the initial non-vowel of VR. The homorganic-nasal rule is obligatory in Akuapem, Asante, and some Fante dialects, optional in other Fante dialects. Some examples of its operation are:

<u>Before</u>		<u>After</u>
<u>Homorganic-Nasal Rule</u>		<u>Homorganic-Nasal Rule</u>
[simsẽmʔ]	'strip'	[sinsẽmʔ]
[hĩmhĩmʔ]	'blow the nose'	[hĩŋhĩmʔ]
[mĩnmĩnʔ]	'swallow'	[mĩmmĩnʔ]
[kunkwanʔ]	'cackle'	[kũŋkwanʔ]
[pĩŋpãŋʔ]	'leave a space'	[pĩmpãŋʔ]
[tũŋtũŋʔ]	'sell'	[tũntũŋʔ]

(Various subsequent rules may alter the forms shown in the right-hand column above. For example, in those cases where the vowel of RED is not nasalized at this point in the rules, it is subsequently nasalized by P 74. Subsequent rules that may alter the forms of the VRs are discussed in Sections 4.73 and 4.74.)

(c) In Akuapem (and perhaps in some subdialects of the other dialects) a nasal consonant at the end of monosyllabic RED is normally deleted before a [+Nasal] non-vowel at the beginning of VR. The rule that deletes the nasal consonant (P 26) is obligatory in some cases and optional in others. That is, there are some cases in which the only occurring surface form of RED shows deletion of the final nasal consonant, while there are others in which surface forms of RED with and without final nasal consonants occur as free variants. (Apparently the obligatoriness or optionality of the rule does not depend upon generalizable phonological characteristics of the VRs, but is a matter, instead, of idiosyncratic rule features associated with individual VRs.) In most of those cases in which free variation occurs, the form without a nasal consonant in RED is preferred.

The nasal-deletion rule operates to delete the final nasal consonant of RED not only before the nasal consonants [m] and [n] and [ŋ] (the nasal consonant [ŋ] does not occur root-initially at the point in the P-rules at which this rule applies), but also before the [+Nasal] glides [w̃], [ɥ̃], and [h̃]. Examples are:

	Before Nasal-Deletion Rule		After Nasal-Deletion Rule
Ak	[mĩmmĩm?]	'sink'	[mĩmĩm?]
Ak	[nũnnũm?]	'suck'	[nũnũm?]
Ak	[pĩppĩŋ?]	'grow'	[pĩpĩŋ?]
Ak	[wũŋwũān?]	'scrape out'	[wũwũān?]
Ak	[ũĩŋũĩn?]	'weave'	[ũĩũĩn?]
Ak	[hĩŋhĩm?]	'blow the nost'	[hĩhĩm?]

(The forms listed in the left-hand column assume that the homorganic-nasal rule discussed in the preceding subsection precedes the nasal-deletion rule.)

(d) In Akuapem and Asante, a [-Nasal, +Voiced] consonant at the beginning of VR is changed to its [+Nasal] counterpart after a [+Nasal] consonant occurring at the end of a monosyllabic RED. The progressive-nasalization rule which effects this change (P 72) is not limited to the context of RED + VR, but, rather, operates whenever an appropriate consonant sequence (i.e., [+Nasal] followed by [-Nasal, +Voiced]) occurs within word boundaries at the point in the P-rules at which progressive nasalization applies. Thus changes of the same kind occur in VRs immediately after the negative nasal prefix (cf. Section 4.40) or the optative nasal prefix (cf. Section 4.35) as occur after a RED that ends in a nasal consonant. Examples of the operation of the progressive-nasalization rule in RED + VR structures are:

	<u>Before Progressive Nasalization</u>		<u>After Progressive Nasalization</u>
Ak-As	[bumbumʔ]	'spread'	[bummumʔ]
Ak-As	[dundɔŋʔ]	'soak'	[dunnɔŋʔ]
Ak-As	[dʒaɪndʒamʔ]	'bewail'	[dʒaɪɲamʔ]
{ Ak	[gungwəŋʔ]	'wither'	{ [gunɲwəŋʔ]
As	[dʒɪɪndʒɪɪŋʔ]		[dʒɪɪɲɲɪɪŋʔ]

(For an account of the dialect difference in the last example, cf. subsection (a), above.)

The progressive-nasalization rule does not operate in most Fante subdialects, which accounts for the contrast between the Fante surface forms [bũmbũm?], etc. on the one hand and the Akuapem-Asante surface forms [bũmmũm?], etc. on the other. (For the nasalization of the vowels in the surface forms just cited, cf. P 74.)

Note that the progressive-nasalization rule must follow the Akuapem nasal-deletion rule discussed in subsection (c), above, since a nasal consonant at the end of RED is not deleted before a nasal consonant that is introduced by means of the progressive-nasalization rule. This fact accounts for contrasts such as Ak [nũnũm] 'suck' vs. Ak [dũnnũm] 'extinguish', which show the following derivations:

Before monosyllabic-RED	RED + nũm?	RED + dum?
Monosyllabic-RED	nũmnũm?	dumdum?
Homorganic-Nasal	nũnnũm?	dundum?
Nasal-Deletion	nũnũm?	
Progressive-Nasalization		dunnum?
Close-Vowel Nasalization		dũnnũm?

4.63 General Rule of Disyllabic RED.

The general rule of disyllabic reduplication, P 23, applies to a RED prefix that immediately precedes either a VR with two or more syllables or another RED prefix, the shape of which has already been specified. The rule operates to replace the RED symbol to which it applies by a sequence of two syllables. These two syllables are identical to the two syllables that immediately follow RED, except that, if the second syllable after RED ends in a [-Nasal] non-vowel (i.e., [r], [w], or [?]), this non-vowel is not copied in the formation of RED. (If the second syllable after RED ends in a [+Nasal] non-vowel (i.e., [m], [n], or [ŋ]), this non-vowel is copied in the formation of RED, although it may be optionally deleted by a subsequent P-rule--cf. discussion in Section 4.64, subsection (a).)

Some examples of the operation of the disyllabic-RED rule, when RED occurs immediately before a VR with two or more syllables, are:

<u>VR</u>			<u>RED + VR</u>	
	<u>kasa</u>	'speak'		<u>kasakasa</u>
	<u>kamfo</u>	'praise'		<u>kamfokamfo</u>
{	Ak <u>nantew</u>	'walk'	{	Ak <u>nantenantew</u>
	As <u>nante</u>			As <u>nantenante</u>
	Fa <u>nantse(w)</u>			Fa <u>nantsenantse(w)</u>
{	<u>yeram</u>	'yawn'	{	<u>yeramyeram</u>
	<u>haram</u>			<u>haramharam</u>
	<u>kanyan</u>	'stir up'		<u>kanyankanyan</u>
Ak	<u>patiriw</u>	'slide'		<u>patipatiriw</u>

(Yeram and haram are dialectal variants.)

As is noted in Section 4.60 an indefinitely long sequence of RED symbols may be generated by the base rules. In such sequences, the monosyllabic-RED rule applies only to an occurrence of RED immediately before a monosyllabic VR, and the disyllabic-RED rule applies in all other cases. Thus the disyllabic-RED rule applies to an occurrence of RED that precedes any other occurrence of RED, whether the latter is itself monosyllabic or disyllabic. For example, given the sequence RED + RED + to 'buy', first the monosyllabic-RED rule applies to the RED immediately preceding to to convert the sequence to RED + toto, then the disyllabic-RED rule applies to convert the sequence to totototo. Further examples of structures of this type are:

<u>VR</u>			<u>RED + VR</u>	<u>RED + RED + VR</u>
{	Ak-As <u>foro</u>	'climb'	{	{
	Fa <u>for</u>			
	<u>san</u>	'return'	<u>sensan</u>	<u>sensansensan</u>
	<u>gya(w)</u>	'leave'	<u>gyigya(w)</u>	<u>gyigyagyiga(w)</u>
	<u>kum</u>	'kill'	<u>kunkum</u>	<u>kunkumkunkum</u>
	<u>nam</u>	'walk'	<u>ne(n)nam</u>	<u>ne(n)namne(n)am</u>

(The parenthesized '(w)'s in the third example represent dialect variation. They are present in Akuapem and some Fante subdialects, but are replaced by [ʔ] in Asante and other Fante subdialects. The parenthesized '(n)'s in the last example also represent dialect variation. In Akuapem, they are usually absent, as a result of the application of the nasal-deletion rule (cf. Section 4.62, subsection (c)), but they are retained in the other dialects.)

Similarly, given the sequence RED + RED + Ak nantew 'walk', the disyllabic-RED rule applies first to the RED immediately preceding nantew, to yield RED + nantenantew, and then again, to yield nantenantenantew.

4.64 Subsidiary Rules Affecting Disyllabic RED.

After the general disyllabic-RED rule has applied, there are a number of other rules that may or must apply to alter the forms generated by it. Among these rules are two affecting the tones of such forms, which are discussed separately in Section 4.94. The present section discusses six rules which affect the segmental structure of forms that result from application of the disyllabic-RED rule. These rules, which are discussed in turn below, are: (a) nasal deletion in disyllabic RED, P 24; (b) homorganic nasal, P 25; (c) progressive voiced non-vowel nasalization, P 72; (d) vowel gemination in disyllabic RED, P 27; (e) vowel gemination in RED + RED structures, P 28; (f) [ə] → [æ]/[e], P 84.

(a) If the second syllable after RED ends in a [+Nasal] consonant, the disyllabic-RED rule copies this final consonant. There is, however, a subsequent rule (P 24) that optionally deletes a final nasal consonant from disyllabic RED if the consonant is preceded by a vowel in the same syllable. (Where the nasal consonant is not preceded by a vowel in the same syllable--i.e., where it is syllabic, as in man 'turn' (Ak [mãŋʔ], As [mãĩ], Fa [mã̀n])--it is never deleted.) Examples of the operation of this rule are:

<u>Before Final-Nasal Deletion</u>		<u>After Final-Nasal Deletion</u>	
{ <u>yeramyeram</u> <u>haramharam</u> }	'yawn'	{ <u>yerayeram</u> <u>haraharam</u> }	
<u>kanyankanyan</u>	'stir up'	<u>kanyakanyan</u>	
<u>pempampempam</u>	'sew'	<u>pempapempam</u>	
<u>pempanpempan</u>	'leave a space'	<u>pempapempan</u>	
<u>sensensensen</u>	'hang'	<u>sensensensen</u>	

In those cases in which the RED from which the final nasal is deleted immediately precedes a disyllabic VR (or a reduplication of such a VR), the nasality of the vowel before the deleted nasal is not affected by the deletion. If the vowel was [-Nasal] before deletion of the consonant, it remains [-Nasal] (e.g., Ak [jìrámjìràṁ?] → [jìrájìràṁ?]), and if it was [+Nasal] before deletion of the consonant, it remains [+Nasal] (e.g., Ak [kǎṇǎṅkǎṇǎṅ?] → [kǎṇǎkǎṇǎṅ?]). (For an explanation of the tone patterns of the forms cited in this section, see Section 4.94.) In those cases, on the other hand, in which the RED precedes RED plus a monosyllabic VR (or a reduplication of such a sequence), the final-nasal-deletion rule specifies that the preceding vowel becomes [+Nasal] in all cases. This part of the rule applies vacuously if the vowel was [+Nasal] before deletion of the consonant. Thus Ak [pìmpǎṅpìmpǎṅ?] → [pìmpǎpìmpǎṅ?] (ultimately, [pǐmpǎpìmpǎṅ?]). But if the vowel was [-Nasal] before deletion of the consonant, the final-nasal-deletion rule changes it to [+Nasal]. Thus Ak [pìmpámpìmpám?] → [pìmpǎpìmpám?] (ultimately, [pǐmpǎpìmpám?]), and Ak [sìnsén̄sìnsèn̄?] → [sìnsǎ́sìnsèn̄?] (ultimately, [sǐnsǎ́sìnsèn̄?]). (Akuapem forms have been cited in order to avoid irrelevant dialect variations. Apparently, also, use of the nasal-deletion rule is more widespread in Akuapem than it is in the other dialects. Asante speakers, in particular, seem to use the rule in only a limited number of cases, and although in these cases forms with and without final nasals in RED alternate freely, in many other cases only forms in which the final nasal is retained are acceptable.)

(b) As was noted in Section 4.62, subsection (b), application of the homorganic-nasal rule (P 25) to a final nasal consonant in a monosyllabic reduplicating prefix is obligatory in most dialects. In the case of a disyllabic reduplicating prefix, on the other hand, application of the homorganic-nasal rule is never obligatory when the final nasal of RED is preceded by a vowel in the same syllable. If a RED of this type is generated, and if the optional nasal-deletion rule discussed in subsection (a), above, is not applied, Akuapem and Fante speakers may optionally apply the homorganic-nasal rule in certain cases, while Asante speakers apparently never apply it. (Even in those dialects in which the rule may be applied, its use is rather erratic, and it does not seem to be possible to predict on any general basis in just which cases application of the rule is possible.) For those speakers who use the rule, a form like [kũŋkũmkũŋkũm?] (RED + RED + kum 'kill') may optionally be changed to [kũŋkũŋkũŋkũm?]. Similarly, Ak [tũntũntũntũntũn?] (RED + RED + ton 'sell') may be changed to [tũntũntũntũntũn?] (ultimately [tũntũntũntũntũn?]) and Fa [kĩŋkĩŋkĩŋkĩn?] (RED + RED + kan 'count') to [kĩŋkĩŋkĩŋkĩn?] (ultimately [kĩŋkĩŋkĩŋkĩn?]).

In Akuapem, but not in Asante or Fante, application of the homorganic-nasal rule is obligatory in reduplicated forms of disyllabic VRs like man 'turn aside', whose second syllable is a syllabic nasal. Thus Ak [màŋmàŋ?] → [màmàmàŋ?].

(c) The Akuapem-Asante progressive voiced non-vowel nasalization rule, P 72, changes a [-Nasal, +Voiced] non-vowel to its [+Nasal] counterpart after a [+Nasal] consonant in the same word. This rule follows the homorganic-nasal rule, and is inapplicable where the homorganic-nasal rule has not applied.

As was noted in subsection (b), above, the homorganic-nasal rule may apply in Akuapem, but apparently not in Asante, to a nasal occurring at the end of a disyllabic RED. Where the nasal is syllabic, as in the case of màn 'turn aside', application of the homorganic-nasal rule in Akuapem is obligatory. In other cases, the rule may be either optional or inapplicable.

In those cases in which the homorganic-nasal rule has applied, either obligatorily or optionally, to a nasal that immediately precedes a [-Nasal,+Voiced] non-vowel, this non-vowel is obligatorily changed, by means of the progressive-nasalization rule, to its [+Nasal] counterpart. Thus if the homorganic-nasal rule has optionally applied to change Ak [dùnnúmdùnnùṁ?] [RED + RED + dum 'extinguish') to [dùnnúndùnnùṁ?], the latter is obligatorily changed, by means of the progressive-nasalization rule, to [dùnnúnnùṁ] (ultimately, [dùnnúnnùṁṁ?]). Similarly, after the homorganic nasal rule has operated obligatorily to change Ak [dàṅdàṅ?] (RED + dan 'turn') to [dàṅdàṅ?], the latter is in turn obligatorily changed to [dàṅṅàṅ?] by the progressive-nasalization rule.

Since Asante apparently never permits application of the homorganic-nasal rule to a final nasal in disyllabic RED, the progressive-nasalization rule cannot apply to the consonant that immediately follows the RED. Thus Asante does not have forms like [dùnnúnnùṁṁ?] or [dàṅṅàṅ?]. In Asante, RED + RED + dum is realized either as [dùnnúmdùnnùṁ?], or, if nasal-deletion has applied, [dùnnúḍùnnùṁ?]. RED + dan(e) (As [dǎí] ~ [dǎí]) has a variety of realizations in Asante--[dǎíḍǎí], [dǎíḍǎí], [dǎíḍǎí]--none of which shows progressive nasalization.

In some cases, the homorganic-nasal rule applies vacuously: that is, the nasal consonant to which the rule applies happens already to be homorganic with the following non-vowel, and thus is not changed by application of the rule. For example, when the homorganic-nasal rule applies obligatorily to the Akuapem formation [gwèṅgwèṅ?] (RED + [gwèṅ?] 'flee'), the product of the rule is still [gwèṅgwèṅ?]. But even where the homorganic-nasal rule has applied vacuously, the progressive-nasalization rule that is contingent upon it still applies, and changes [gwèṅgwèṅ?] to [gwèṅṅwèṅ?].

(d) Fante has two optional vowel-gemination rules that apply to structures that include disyllabic

RED. Both rules operate to replace part of the structures to which they apply by a sequence of two identical vowels. The first of these rules, which is discussed in the present subsection, is P 27, the rule of vowel gemination in disyllabic RED; the second of the rules is discussed in subsection (e), below.

The rule of vowel gemination in disyllabic RED applies optionally to a RED whose second syllable consists either of a syllabic non-vowel or of the vowel [ɪ]. The rule operates to replace the syllabic non-vowel or the [ɪ] by a copy (except for tone) of the vowel of the first syllable. If it is a nasal consonant that is replaced, its [+Nasal] feature is transferred to the replacing vowel and to the vowel of the first syllable. (If the vowel of the first syllable is already [+Nasal], the feature-transfer applies vacuously.) Some examples are:

	<u>Before Vowel Gemination</u>		<u>After Vowel Gemination</u>
Fa	[dándàhʔ]	'turn'	[dǎǎdàhʔ]
Fa	[mǎnhmàhʔ]	'turn aside'	[mǎǎmàhʔ]
Fa	[fìrfìrʔ]	'borrow'	[fiifìrʔ]
Fa	[çyìrçyìrʔ]	'waste'	[çyìíçyìrʔ]
Fa	[pàípàì]	'break'	[pǎápàì]
Fa	[djèédjèì]	'cease'	[djèéédjèì]

(For an account of the derivation of VRs of the types involved in these examples, as well as an explanation of the apparently anomalous tone patterns of the first two examples, cf. Section 4.77.)

In the case of the last two examples listed, a second part of the vowel-gemination rule obligatorily changes the [A] of the VR to [E]. Thus [pǎápàì] → [pǎápèì] and [djèéédjèì] → [djèéédjèè]. Furthermore, [djèéédjèè] undergoes the tenseness-harmony rule--cf. subsection (f), below--which results in the form [djèéédjèè].

(e) The second of the Fante vowel-gemination rules is P 28. This rule (which may be found in sub-dialects of other dialects as well) applies to structures

of the shape RED + RED + VR, where the VR is monosyllabic. As is explained in Section 4.63, the first RED of such a structure is realized as a disyllabic reduplicating prefix, the second as a monosyllabic reduplicating prefix. Thus, given a structure such as RED + RED + *ba* 'come', the realization is *bebabe*ba [bìbábìbà], which has the internal structure RED[bìba] + RED[bì] + VR[ba]. The optional Fante rule under discussion in some cases affects both the second and third syllables of the structures in question (i.e., both the second syllable of the disyllabic RED and the monosyllabic RED) and in other cases just the third syllable (i.e., the monosyllabic RED). The second syllable is affected only when its vowel is [A] and/or when it includes a final consonant. The rule operates to replace [A] by [E] as the vowel of the second syllable. (More precisely, the rule changes the vowel from [+Low] to [-Low], leaving all its other features intact.) If the second syllable includes a final consonant, which is necessarily [+Nasal], this consonant is deleted, but its [+Nasal] feature is transferred to the preceding vowel. (If the vowel is already [+Nasal], the feature-transfer applies vacuously.) The third syllable is in all cases replaced by a single vowel, which is (except for tone) a copy of the vowel of the second syllable. (Where [E] has replaced [A] in the second syllable, it is [E] that is copied in the third syllable.) Some examples of the operation of the rule are:

<u>Before Vowel</u> <u>Gemination</u>		<u>After Vowel</u> <u>Gemination</u>
[bìbábìbà]	'come'	[bìbèèbà]
[pìmpámpìmpàm?]	'sew'	[pìmpèèpàm?]
[tçyítçyéètçyítçyè?]	'cut'	[tçyítçyéèètçyè?]
[sìnsěmsìnsěm?]	'strip'	[sìnsèèsěm?]
[tçìtçíttçìtçìr?]	'catch'	[tçìtçíttçìr?]
[dzìdzìdzìdzì]	'eat'	[dzìdzìdzìdzì]
[çyìçyéçyìçyè]	'look for'	[çyìçyéèçyè]
[fùfùfùfùr?]	'climb'	[fùfùfùfùr?]
[dùdùdùdùr?]	'arrive'	[dùdùdùdùr?]
[dùndónndùndòn?]	'soak'	[dùndèèdòn?]

(By the application of a subsequent rule, P 74, [pĩmpěẽpàm?] → [pĩmpěẽpam?], [sĩnsěẽsãm?] → [sĩnsěẽsãm?], and [dũndĩĩdòn?] → [dũndĩĩdòn?].)

(f) The [ə] → [æ]/[e] rule, P 84, replaces an [ə] that is followed by a [+Tense] vowel in the next syllable by an [æ] or [e] (according to whether the underlying [ə] is [-Nasal] or [+Nasal]) in Akuapem and Asante, and by an [e] or [ẽ] in Fante. The rule applies obligatorily in some cases, optionally in others. One of the cases where application of the rule is obligatory in most dialects is the case in which the disyllabic-RED rule has generated a sequence that includes a RED ending in [ə] before a VR or RED whose (first) vowel is tense. Some examples (with tone ignored) are:

<u>Before P 84</u>		<u>After P 84</u>	
[bisəbisə]	'ask'	{ Ak-As [bisəbisə] }	
		{ Fa [bisebisə] }	
[djinẽ]	'stand'	{ Ak-As [djinẽdjinẽ] }	
		{ Fa [djinẽdjinẽ] }	

(In some Fante dialects, application of P 84 is apparently optional in the context under discussion. In these dialects, [bisəbisə], etc. need not be changed to [bisebisə], etc.)

The [ə] → [æ]/[e] rule does not apply in cases in which a disyllabic RED ends in [ə] plus a nasal consonant. Thus the reduplication of [biɾəm] 'beat' is [biɾəmbiɾəm]. If, however, the optional rule of nasal deletion in disyllabic RED (P 24) applies, changing [biɾəmbiɾəm] to [biɾəbiɾəm], the [ə] → [æ]/[e] rule applies to the latter form, yielding Ak-As [biɾəbiɾəm], Fa [biɾebiɾəm]. (For a discussion of the rule of nasal deletion in disyllabic RED, cf. subsection (a), above.)

4.70 Verb Roots.

The great majority of Akan VRs have underlying forms with either one or two syllables. There are also

a few VRs with underlying trisyllabic forms. The underlying structure of monosyllabic, disyllabic, and trisyllabic morphemes that function as VRs is essentially the same as that of other root morphemes with the same number of syllables. This means that VRs conform to all of the morpheme-structure conditions presented in Chapter 2, and that, in the present chapter, it will be necessary to specify only such additional morpheme-structure conditions as apply to VRs to the exclusion of root morphemes of other types. Similarly, VRs are subject to all of the general P-rules (nasalization, labialization, palatalization, etc.) discussed in Chapter 3, and it will be necessary here to discuss only those additional P-rules that apply to VRs exclusively. The discussion is organized as follows: monosyllabic VRs are discussed in Sections 4.71 through 4.74, disyllabic VRs in Sections 4.75 through 4.77, and trisyllabic VRs in Section 4.78. Section 4.79 is devoted to a discussion of final glottal stops in VRs.

4.71 Tone Raising in Monosyllabic VRs.

In the case of monosyllabic VRs, there are apparently no special morpheme-structure conditions that distinguish the VRs from monosyllabic root morphemes of other types. That is, apparently all and only those sequence-structure and segment-structure conditions that apply to monosyllabic root morphemes in general apply to monosyllabic VRs. (For a discussion of sequence-structure conditions that apply exclusively to disyllabic VRs, cf. Section 4.75.) There are, however, some P-rules that apply exclusively or primarily to monosyllabic VRs. One of these, the rule of tone raising in monosyllabic VRs (P 19), is the subject of the present section.

In their underlying forms, VRs, like root morphemes of other types, may have either high or low tone on their vowels. Thus ye /jé/ 'do, insult' is a high-tone monosyllabic VR while pe /pè/ 'seek, gather' is a low-tone monosyllabic VR. In surface forms, on the other hand, the contrast between high-tone and low-tone monosyllabic VRs is often lost. The contrast is best preserved in Fante, where we find surface tone patterns such as:

	<u>High-Tone VR</u>		<u>Low-Tone VR</u>
Fa	<u>òbényé</u> 'he will do'	<u>òbépè</u>	'he will seek'
Fa	<u>ònyé</u> 'he doesn't do'	<u>òmpè</u>	'he doesn't seek'

Akuapem and Asante do not show surface tonal contrasts in these cases. In these two dialects òbényé and òbépè have the same tone pattern (Ak-As òbényé, òbépè), as do ònyé and òmpè (Ak-As ònyé, òmpè). (In some Fante sub-dialects, òbépè varies freely with òbényé and òmpè varies freely with ònyé. For a discussion of this variation, see below.)

In Asante, while the contrasts cited above for Fante do not occur, there are a few cases in which surface tone patterns do reflect the underlying contrast between high-tone and low-tone monosyllabic VRs. Thus Asante shows tonal differences like the following:

	<u>High-Tone VR</u>		<u>Low-Tone VR</u>
As	<u>òrèyé</u> [<u>òòyé</u>] 'he is doing'	<u>òrèpè</u> [<u>òòpè</u>]	'he is seeking'
As	<u>òbényé</u> <u>nó</u> 'he will insult him' (literally: 'he will do him')	<u>òbépè</u> <u>nò</u>	'he will seek him'

(In the second example, the underlying tonal contrast between the VRs is reflected in the surface forms by the tone on the object pronouns, rather than by the tone on the VRs themselves--see discussion below.)

In Akuapem, on the other hand, there are never any surface tonal differences that reflect the underlying contrast between high-tone and low-tone monosyllabic VRs. For example, the Akuapem equivalents of the above Asante forms are:

Ak	<u>òréyé</u>	'he is doing'	<u>òrépè</u>	'he is seeking'
Ak	<u>òbényé</u> <u>nò</u>	'he will insult him'	<u>òbépè</u> <u>nò</u>	'he will seek him'

The explanation for dialect differences like those cited above is to be found in a P-rule, P 19, that changes low tone on a monosyllabic VR to high tone. In Akuapem the rule is obligatory in all cases, so that all underlying low tones on VRs are changed to high. (Subsequent P-rules may, however, result in surface forms in which VRs have low tone.) In Asante the rule is obligatory except where the VR immediately follows the PROgressive-aspect morpheme (cf. Section 4.32), in which case it does not apply. (The non-application of the rule to affirmative-progressive verbs in Asante accounts for the above-cited tonal contrast between òyè and òpè. The tonal contrast between òbéyé nó and òbépé nò results from an Asante P-rule, P 17, that changes the underlying low tone of sentence-final object pronouns to high tone in certain cases. One such case is when the object pronoun occurs after a high-tone ASP marker plus a high-tone monosyllabic VR. Since the object-pronoun tone-raising rule precedes the rule that raises the tone of monosyllabic VRs, òbéyé and òbépé are still tonally distinct at the point in the P-rules at which the object-pronoun rule applies, and the rule operates to raise the tone of a sentence-final pronoun after the former but not after the latter. For further discussion of Asante object-pronoun tone-raising, cf. Section 4.95.)

In Fante, the monosyllabic-VR tone-raising rule is never obligatory. In some subdialects the rule does not occur at all, while in others it is optional. Those subdialects in which tone-raising does not occur always show surface tonal contrasts such as that between òbéyé and òbépé or ònyé and òmpé. Those subdialects in which tone-raising is optional have òbépé varying freely with òbépè and òmpé varying freely with òmpè, and the variant forms that reflect the application of the tone-raising rule are tonally identical with similarly-constituted forms that have an underlying high-tone VR.

(Since in Akuapem the distinction between high-tone and low-tone monosyllabic VRs is always obliterated, in a phonology devoted to this dialect alone, it would be possible to say that the underlying tone of the vowels of all monosyllabic VRs is high, and to state a special morpheme-structure condition to this effect. Given the comparative orientation of the present study, however, it

seems preferable to account for the absence of tonal contrasts between monosyllabic VRs in Akuapem in the way discussed above.)

(It should be noted that, in some cases, P-rules other than the monosyllabic-VR tone-raising rule may account for a surface high tone on a monosyllabic VR with underlying low tone. For example, when a monosyllabic VR immediately follows the OPTative-aspect morpheme (cf. Section 4.91, subsection (g)), P 49 requires that its tone be high, so that in this context even those Fante dialects in which the monosyllabic-VR tone-raising rule never applies show surface high tone on VRs with underlying low tone: e.g., šmpé 'he should seek'. Similarly, there are P-rules that may change an underlying high tone on a VR to low: e.g., the Akuapem-Fante tone-reversal rule, P 50, that accounts for Ak-Fa šyé 'he does', šréyé 'he is doing', etc.--cf. As šyé 'he does', ššyé 'he is doing'.)

4.72 Replacement of Final Non-Vowel in Monosyllabic VRs by Glottal Stop.

There are significant dialect differences in the P-rules that apply to monosyllabic VRs whose underlying forms end in a non-vowel. As is noted in Chapter 2, the final non-vowels that occur in underlying forms are the six stop (i.e., [-Continuant]) consonants /p,t,k,b,d,g/, which are changed by P-rules to [w,r,ʔ,m,n,ŋ] respectively. After these changes have occurred, various other P-rules may apply to make further changes in forms with final non-vowels. The further changes are discussed in the present section and the two that immediately follow it.

As was noted above, underlying final /k/ is changed to a glottal stop by an early P-rule. But a final [ʔ] in a surface form may also correspond to an underlying final /p/, /t/, /b/, or /d/ (or may have one of various other sources--cf. Section 4.79). This is because, after early P-rules have changed final /p/, /t/, /b/, and /d/ to [w], [r], [m], and [n] respectively, a later rule may in turn replace one of the latter by [ʔ].

The replacement of final [w] by [ʔ] is dialect-dependent, but is independent of the grammatical function of the root. (The replacement is obligatory in Asante and in some subdialects of Fante, while it does not occur in

other subdialects of Fante or in Akuapem--cf. P 29.) The replacement of final [r], [m], or [n] by [ʔ], on the other hand, is not only dialect-dependent but is confined largely to cases in which the [r], [m], or [n] occurs at the end of a monosyllabic VR.

The P-rule that replaces a final [r], [m], or [n] by [ʔ] in a monosyllabic VR (P 30) depends for its operation on the presence of a special rule feature on the VR. That is, it apparently cannot be predicted on any general basis just which VRs with final [r], [m], or [n] permit or require the replacement, and which do not. Furthermore, there are many VRs that are specified positively for this rule feature in Asante but negatively in Akuapem and/or Fante, and there are differences in detail in the way in which the rule operates in the several dialects.

In Asante, the rule applies to the majority of monosyllabic VRs with final [r] or [n] and to many with final [m], but is almost always optional. (When the option of glottal-stop replacement is not exercised, further rules obligatorily apply to the forms in question--cf. Section 4.73.) In the case of at least one VR, [kɔ̃r] (underlying form: /kɔ̃t/) 'go', the rule is optional only when the VR is followed by the PAST-aspect suffix (cf. Section 4.33), but is obligatory in all other cases. Thus, while 'he went' is, in Asante, either [ɔ̃kɔ̃rɪi] or [ɔ̃kɔ̃ɪi], 'he goes' is only [ɔ̃kɔ̃ʔ]. (The absence of a glottal stop in [ɔ̃kɔ̃ɪi] results from the operation of P 04, which deletes all glottal stops that are not followed by a pause.) For most other VRs with final [r] or [n], and many with final [m], glottal-stop replacement is optional in Asante, regardless of context. Some examples (with tone ignored) are:

Before [r,m,n] → [ʔ]	After [r,m,n] → [ʔ]
[dur] 'reach'	[duʔ]
[fir] 'leave'	[fiʔ]
[war] 'be long'	[waʔ]
[hĩm] 'blow the nose'	[hĩʔ]
[kũm] 'kill'	[kũʔ]
[nĩm] 'know'	[nĩʔ]
[hũn] 'see'	[hũʔ]
[pĩn] 'pinch'	[pĩʔ]
[tũn] 'forge'	[tũʔ]

In Akuapem and Fante the rule replacing final [r,m,n] in a monosyllabic VR by [ʔ] applies in many fewer cases than it does in Asante, but in those cases where it does apply, its application is usually obligatory. In Akuapem the application of the rule is independent of the grammatical context. Thus in Akuapem, [dur] 'reach' → [duʔ] and [kɔr] 'go' → [kɔʔ] in all contexts. (The rule is obligatory in Akuapem for [dur], [kɔr], [far] 'take', [fir] 'leave', [hũŋ] 'see', and perhaps some other VRs. The rule is optional for at least one VR--underlying /kuɛt/, surface [tɕɛʔ] or [tɕɛrɪʔ] 'cut'--but in this case as well its application does not depend upon the grammatical context.) In Fante, according to Stewart, 1962 (pp. 139-140), the rule applies to only five VRs, and is, furthermore, context-dependent. The five VRs are: [dur], [far], [hũn], [kɔr], and [tɕɛr]. (The last of these is the form of underlying /kuɛt/ at the point in the rules at which the rule under discussion applies.) The contexts in which the rule applies are (in the subdialect of Fante described by Stewart): (1) when the VR is immediately followed by an object; (2) when it is immediately followed by another VR (as part of a serial-verb construction); (3) in the case of [far] and [tɕɛr], but not the other three VRs, when it is followed by the past suffix. Examples of surface forms involving [far] are:

Fa [òfàʔ]	'He takes (it).'
Fa [òfà nãm]	'He takes meat.'
Fa [òfà mã kòfi]	'He takes (it) for Kofi.' (literally: 'he-takes gives Kofi')
Fa [òfài]	'He took (it).'

(For an explanation of the final [ʔ] in [òfàʔ], cf. Section 4.74. In the other examples, the [ʔ] that replaces the [r] of [far] is deleted by the general rule, P 04, deleting all glottal stops not immediately followed by pause.)

(Fante subdialects other than those investigated by Stewart may show differences in detail from the subdialect he describes, with respect to the operation of the [r,m,n] → [ʔ] rule. Thus for at least some Fante speakers [kũm] 'kill' may undergo the rule, and the rule may apply to forms in grammatical contexts other than those listed: e.g., in absolute-final position.)

4.73 Vowel Addition in Monosyllabic VRs.

The rule just discussed in Section 4.72 replaces a final [r], [m], or [n] in a monosyllabic VR by [ʔ]. If this rule does not apply to a particular VR of the appropriate form, or if it applies optionally and the option is not exercised, a later rule, P 31, obligatorily applies to add a vowel after the [r], [m], or [n]. This same rule applies to add a vowel after a final [w] (which corresponds to an underlying /p/) or a final [ŋ] (which corresponds to an underlying /g/) in a monosyllabic VR. (The effects of the vowel-addition rule are frequently reversed, in whole or in part, by a still later rule that replaces the added vowel by [ʔ]--cf. Section 4.74, subsection (a).) The vowel that is added by P 31 is a close--i.e., [+High, -Low]--vowel that is specified for the features [+Back], [+Tense], and [+Nasal] according to certain features of vowel and/or final non-vowel of the VR. Specifically, the added vowel is [+Back] if the vowel of the VR is [+Back, +High] (i.e., [U]) or if the final non-vowel of the VR is [m] or [w]; otherwise it is [-Back]. The added vowel is [+Tense] if the vowel of the VR is [+Tense, -Low], and it is [+Nasal] if the final non-vowel of the VR is [+Nasal]; otherwise it is [-Tense, -Nasal]. Some examples are:

<u>Before Vowel Addition</u>	<u>After Vowel Addition</u>
[jír] 'overflow'	[jírì]
[sár] 'hinder'	[sárì]
[sór] 'worship'	[sórì]
[kúr] 'thatch'	[kúrù]
[hím] 'blow the nose'	[hímǔ]
[fém] 'borrow'	[fémǔ]
[dúm] 'extinguish'	[dúmǔ]
[ǔín] 'weave'	[ǔínǐ]
[sén] 'go beside'	[sénǐ]
[tún] 'forge'	[túnǔ]
[féw] 'thrive'	[féwù]
[háw] 'trouble'	[háwù]
[púw] 'throw out'	[púwù]

<u>Before Vowel Addition</u>		<u>After Vowel Addition</u>
[sén]	'hang'	[sénĩ]
[kán]	'count'	[kánĩ]
[tón]	'sell'	[tónĩ]

(The forms listed above reflect the operation of the tone-raising rule discussed in Section 4.71. In those dialects in which tone raising does not apply, VRs with underlying low tone still have low tone at the point in the rules at which vowel addition occurs. In these dialects, for example, the low-tone roots /tũd/ 'forge' and /tòg/ 'sell' have the forms [tũn] and [tòn] respectively before vowel addition. Vowel addition changes [tũn] to [tũnĩ] and [tòn] to [tònĩ].)

4.74 Other Rules Affecting Monosyllabic VRs.

This section discusses four further rules that affect certain monosyllabic VRs. The discussion is arranged as follows: (a) tone spreading (P 01) and added vowel → [ʔ] (P 33); (b) [ŋ] → [n] (P 70) and [ŋʔ] → [ĩ] (P 71).

(a) The vowel that is added by the vowel-addition rule discussed in Section 4.73 is in many instances later lost through application of a rule, P 33, that replaces the added vowel by [ʔ] in certain specifiable contexts. In such cases, however, there is often, in addition to the [ʔ], another trace left of the effects of the vowel-addition rule: namely, a low tone on the non-vowel that precedes the glottal stop. This low tone reflects the application of tone-spreading rule, P 01, which copies the tone of a vowel onto voiced non-vowels in the same syllable. (The tone-spreading rule has a condition on it to the effect that it reapplies immediately whenever the conditions for its application are met.) For example, when the vowel-addition rule changes [dum] 'extinguish' to [dúmũ], this latter form is automatically resyllabified as [dú=mũ] (by the resyllabification rule, P 32), and the tone-spreading rule applies to change [dú=mũ] to [dú=m̃ũ]. (Actually, the form is [dú=m̃ũ], since the high tone of the [ú] is spread to the preceding [d]. But in transcriptions in this text we do not ordinarily show the effects of tone spreading in such cases.) When the final [ũ] of [dú=m̃ũ] is replaced by [ʔ], the [m̃] still retains its low tone, which accounts for the tone pattern found in, e.g., Ak-As

[òbédúm kànfá] 'He will extinguish a lamp.' (In the example, there is no [ʔ] after [òbédúm] because of the effects of P 04, which deletes any [ʔ] not followed by a pause, and which reapplies whenever the conditions for it are met.)

The rule replacing an added vowel by [ʔ] is most restricted in its operation in Asante, less restricted in Akuapem, and still less restricted in Fante. In Asante the rule applies obligatorily to a [U] that has been added after [m], and, in some cases, either optionally or obligatorily, to an [I] that has been added after [ŋ]. (Those VRs with final [ŋ] to which the rule applies are marked with a special rule feature.) The rule operates to replace the added vowel by [ʔ] except in forms of the so-called "intransitive" past (or "intransitive" negative perfect): i.e., past (or negative-perfect) forms that occur at the end of a sentence or clause (cf. Section 4.33).

Thus the rule operates to change [òbédúmũ] 'he will extinguish (it)' to [òbédúmʔ] and [òbétónĩ] 'he will sell (it)' to [òbétónʔ], but leaves [òdúmũĩ] 'he extinguished (it)' and [òtónĩĩ] 'he sold (it)' intact. (The final tone of [òbédúmʔ] and [òbétónʔ] is changed from low to high immediately before a pause, by means of P 68, and the final [ŋʔ] of [òbétónʔ] is replaced by [ũ] in some Asante subdialects by means of P 71: cf. subsection (b), below.

Asante [òdúmũĩ] → [òdúmĩĩ] (ultimately, [òdũĩĩ]) through operation of a vowel-assimilation rule, P 37 (cf. Section 4.33, subsection (b)). In some Akuapem subdialects forms like [òdúmũĩ] are submitted to the labialization rule, P 09, before undergoing vowel assimilation: cf. Ak [òdũwĩĩ] 'he extinguished (it)', and discussion below. Asante [òtónĩĩ] → [òtónĩĩ] (ultimately, [òtòníĩ]) through operation of the [ŋ] → [n] rule, P 70: cf. subsection (b), below.)

The operation of the rule in Akuapem is similar to its operation in Asante, the only differences being that in Akuapem the rule applies to a [U] that has been added after [w] (as well as [m]) and applies obligatorily to an [I] that has been added after any VR-final [ŋ]. The first of these differences results from the fact that in Asante VR-final [w] is obligatorily replaced by glottal stop by means of P 29, so that the proper conditions for the vowel-addition and vowel-replacement rules are never met. Thus in Asante [háw] 'trouble' → [háʔ], while in Akuapem [háw] → [háwũ] → [háwũ] → [háwʔ]. The second difference accounts

for distinctions such as that between Ak [hũ̀ŋʔ] and As [hũ̀ŋũ] 'swell'. In both dialects [hũ̀ŋ] is changed to [hũ̀ŋũ] by the vowel-addition and tone-spreading rules. In Akuapem, the rule replacing the added vowel by [ʔ] applies obligatorily to [hũ̀ŋũ], changing it to [hũ̀ŋʔ]. In Asante, application of this rule to [hũ̀ŋũ] is optional. If the rule is applied, then the variant Asante form [hũ̀ŋʔ], identical with the Akuapem form, results. But if the rule is not applied, [hũ̀ŋũ] remains intact until it is changed by the [ŋ] → [n] rule--cf. subsection (b), below--to [hũ̀nũ].

As in Asante, the rule that replaces an added vowel by [ʔ] fails to apply in Akuapem when the VR is part of an intransitive-past or intransitive-negative-perfect verb. Thus the rule does not apply to Ak [òdũmũĩ] 'he extinguished (it)' or Ak [òtónĩĩ] 'he sold (it)'. In the case of 'he extinguished (it)', the surface form in Akuapem is [òdũmwĩĩ], while, as noted above, the corresponding Asante form is [òdũmĩĩ]. The labialization of the [m] in the Akuapem form and the absence of labialization in the Asante form reflect the fact that in Akuapem (at least in some sub-dialects), but not in Asante (or Fante), intransitive-past forms that have undergone vowel addition are submitted, when the added vowel is [U], to the labialization rule, P 09. By means of this rule, Ak [òdũmũĩ] → [òdũmwũĩ]. The vowel-assimilation rule, P 37, then changes Ak [òdũmwũĩ] to [òdũmwĩĩ] (ultimately [òdũmwĩĩ]). Since labialization does not apply to As [òdũmũĩ], the vowel-assimilation rule operates to change this form to As [òdũmĩĩ] (ultimately, [òdũmĩĩ]). (For the tonal differences between the past forms of the two dialects, cf. Section 4.91, subsection (d).)

In Fante, the rule that replaces an added vowel by [ʔ] applies regardless of whether the added vowel follows [r], [m], [n], [w], or [ŋ]. The rule fails to apply, however, if the added vowel is immediately followed by another vowel, whether this following vowel is in the same word (in which case it represents the intransitive-past suffix) or in the following word. When the added vowel is retained, it always undergoes assimilation to the following vowel. (As in Asante, labialization does not apply.) Some

examples of Fante surface forms to which the rule replacing an added vowel by [ʔ] have applied (with the glottal stop having been deleted if no pause follows) are:

[ókùrʔ]	'He thatches (it).'
[òkùr dán]	'He thatched a house.'
[ódùmʔ]	'He extinguishes (it).'
[òdùm kàndziá]	'He extinguished a lamp.'
[òǹǹinʔ]	'He weaves (it).'
[óhàw kòfí]	'He bothers Kofi.'
[òtón nãm]	'He sold meat.'

(In the last example, the final [ŋ] of [tón] has been changed to [n] by the [ŋ] → [n] rule.) Examples of surface forms in which the added vowel is retained, but is assimilated to the following vowel, are:

[òkùrii]	'He thatched (it).'
[ókùrà àdán]	'He thatches houses.'
[òdúmiĩ]	'He extinguished (it).'
[ódùmã àkàndziá]	'He extinguishes lamps.'
[òǹǹinĩĩ]	'He wove (it).'
[óhàwà àmbà]	'He bothers Amba.'
[òtòně èdúr]	'He sells medicine.'

(b) As has already been noted, there is an Asante-Fante rule (not restricted to monosyllabic VRs) that replaces [ŋ] by [n] in certain contexts. In Asante this rule, P 70, applies only when the vowel is intervocalic within a word. Thus As [òtònĩĩ] 'he sold it' → [òtònĩĩ], but the [ŋ] of As [òbétónʔ] 'he will sell (it)' remains intact. In Fante, the replacement of [ŋ] by [n] occurs both when the [ŋ] is intervocalic within a word and when it is word-final (or is followed by [ʔ]). Thus not only does Fa [òtónĩĩ] 'He sold it' → [òtónĩĩ] but Fa [òbótónʔ] 'He will sell it' → [òbótònʔ].

Asante also has a rule (once more not restricted to monosyllabic VRs) that replaces a word-final sequence consisting of a velar nasal plus a glottal stop--i.e., [ŋʔ]--

by a nasalized close vowel. The rule operates in two stages, first deleting the final [ʔ], then replacing the [ŋ] by a vowel. (The two stages of the rule are not necessarily interdependent. That is, the [ʔ] may be deleted and the [ŋ] left intact, and, similarly, an [ŋ] that has never been followed by [ʔ]--e.g., a final [ŋ] of a noun--may be replaced by a vowel.) The vowel that results from operation of this rule agrees in backness and tenseness with the preceding vowel, and is thus [ĩ] after a [-Back, +Tense] vowel, [ĩ̃] after a [-Back, -Tense] vowel, [ũ] after a [+Back, +Tense] vowel, and [ũ̃] after a [+Back, -Tense] vowel. The rule, P 70, operates, for example, to change [jĩŋʔ] 'grow' to [jĩĩ], [káŋʔ] 'count' to [káĩ] (ultimately [káĩ̃], after application of the nasal-vowel-agreement rule, P 73), and [tɔŋʔ] 'sell' to [tɔũ] (ultimately, [tɔũ̃]). In some subdialects, this rule applies only when the [ŋʔ] follows a [-Back] vowel, (These subdialects have the change of [jĩŋʔ] to [jĩĩ], and [káŋʔ] to [káĩ], but not the change of [tɔŋʔ] to [tɔũ̃].)

(The rule replacing [ŋʔ] by a nasalized vowel does not apply in Fante, and neither this rule nor the [ŋ] → [n] rule applies in Akuapem.)

4.75 Structure of Disyllabic VRs.

In addition to the sequence-structure constraints on disyllabic morphemes presented in Chapter 2, the underlying forms of disyllabic VRs show certain further constraints on: (a) canonical forms; (b) the vowel qualities that may occur in the successive syllable; (c) the medial non-vowels that may occur; (d) the tone sequences that may occur on the vowels. These constraints are discussed in turn below.

(a) As was noted in Section 2.21, there is a positive condition (PC) to the effect that the canonical form of Akan root syllables is one of the following: /CV/, /CVV/, /CVC/, or /CVVC/. If, however, the syllable is the second syllable of a disyllabic VR, it is further constrained by the following condition:

PC V1: VR [X = [-Vocalic] [+Vocalic] ([-Vocalic])]

That is, the second syllable of a disyllabic VR is always of the shape /CV/ or /CVC/. (Christaller's dictionary lists at least one apparent exception to this generalization: hodwo(w) 'become slack', which, in our analysis, would have the underlying form /hòguép/.)

(b) The vowels that occur in the successive syllables of disyllabic VRs conform to the tenseness-harmony constraint stated in SqSC 5, Section 2.31. (There are one or two exceptions, such as n(y)insèn /dĩdsèg/ 'become pregnant'.) In addition, they conform to at least two other constraints, which may be stated as morpheme-structure conditions that apply specifically to disyllabic VRs: viz.,

$$\begin{array}{l} \text{PC V2:} \quad \text{VR} \left[\begin{array}{c} \text{X} \left[\begin{array}{c} +\text{Vocalic} \\ -\text{High} \\ \alpha\text{Back} \\ \alpha\text{Low} \end{array} \right] \text{X} = \text{X} \left[\begin{array}{c} +\text{Vocalic} \\ -\text{High} \\ \alpha\text{Back} \\ \alpha\text{Low} \end{array} \right] \text{X} \end{array} \right] \\ \\ \text{I-TC V1:} \quad \text{VR} \left[\begin{array}{c} \text{X} \left[\begin{array}{c} +\text{Vocalic} \end{array} \right] \text{X} = \text{X} \left[\begin{array}{c} +\text{Vocalic} \\ +\text{Back} \\ +\text{High} \end{array} \right] \text{X} \end{array} \right] \\ \quad \quad \quad \downarrow \\ \quad \quad \quad \left[\begin{array}{c} +\text{Back} \\ +\text{High} \end{array} \right] \end{array}$$

PC V2 says that if neither of the vowels of the successive syllables of a disyllabic VR is close (i.e., if both are [-High]), then the vowels of both syllables must be identical with respect to tongue-frontness (they must be [αBack]) and tongue-height (they must be [αLow]). The condition thus permits both vowels to be /E/, /A/, or /O/, but does not permit any non-identical succession of these vowels. Examples of VRs permitted by the condition are:

<u>pɛsɛ(w)</u>	/pésèp/	'worry'	<u>pɛtɛ(w)</u>	/pétèp/	'bruise'
<u>kasa</u>	/kàsà/	'speak'	<u>kata</u>	/kàtà/	'cover'
<u>fɔtɔ(w)</u>	/fótòp/	'knead'	<u>pɔtɔ(w)</u>	/pótòp/	'corrupt'

The condition excludes disyllabic VRs of the shapes /CECA/, /CECO/, /CACE/, /CACO/, /COCE/, /COCA/.

I-TC V1 says that if the vowel of the second syllable of a VR is /U/ (i.e., is [+Back,+High]), then the vowel of the first syllable must also be /U/. Thus the condition permits boto(w) /bútùp/ 'decrease', butu(w) /bútùp/ 'upset', etc., but does not permit disyllabic VRs of the shapes, e.g., /CICU/, /CECU/, /CACU/, or /COCU/. (There is at least one VR, kanfo /kábfùk/ 'praise', which must be listed as an exception to the condition.) Note that the converse of this condition does not obtain. That is, if the vowel of the first syllable is /U/, the vowel of the second syllable need not also be /U/. Thus there are VRs such as tumi /túbí/ 'be able', bue /búkè/ 'open', dua /dùgá/ 'plant', suro /sùdó/ 'be afraid', etc.

(It is possible that both of the conditions stated above as specific to disyllabic VRs apply to disyllabic morphemes in general. We have not been able, however, to investigate a number of apparent exceptions to the conditions that would have to be explained were the conditions to be generalized in this way.)

(c) In Chapter 2, only one general morpheme-structure condition was presented which applies exclusively to morpheme-medial non-vowels: viz., SqSC 3, which specifies the shape of syllable-final consonants which are not also morpheme-final. (In combination with SqSC 2, which applies to syllable-final consonants in general, SqSC 3 specifies that a syllable-final consonant that is not morpheme-final must be a voiced stop that is homorganic with the initial non-vowel of the following syllable. The voiced stops that conform to this condition are in all cases changed by a P-rule, P 03, to the corresponding nasal consonants.) The present subsection is concerned with further constraints upon morpheme-medial non-vowels: specifically, those further constraints that apply to morpheme-medial non-vowels in disyllabic VRs. (Once more, it is possible that some of the constraints stated here as specific to VRs apply more generally.) Three such constraints are formalized and discussed below.

I-TC V2: VR $\left[\begin{array}{c} x = [\quad] x \\ \Downarrow \\ [+Consonantal] \end{array} \right]$

This I-TC, in combination with SqSC 2 (Section 2.21), specifies that the initial segment of the second syllable of a disyllabic VR must be a true consonant (i.e., a [-Vocalic, +Consonantal] segment). SqSC 2 specifies that all syllable-initial segments in roots are non-vowels (i.e., [-Vocalic] segments), but permits them to be either true consonants (in which case they are [+Consonantal]) or glides (in which case they are [-Consonantal]). I-TC V2 thus further restricts the class of syllable-initial segments that can occur in roots in those cases where the root is a VR and the syllable is the second syllable. Specifically, the condition excludes VRs of the shape /CVwV/, CVyV/, CVhV/, etc., in which the initial segment of the second syllable is a glide. (Christaller's dictionary includes at least one apparent exception to this condition, kwaha 'tie around'. Informants with whom we have checked are, however, unfamiliar with this item.)

$$\begin{array}{c} \text{I-TC V3: } \text{VR} \left[\begin{array}{c} \text{X} = \begin{bmatrix} -\text{Coronal} \\ -\text{Back} \end{bmatrix} \text{X} \end{array} \right] \\ \Downarrow \\ \begin{bmatrix} -\text{Continuant} \\ +\text{Voiced} \end{bmatrix} \end{array}$$

This condition states that the only labial (i.e., [-Coronal, -Back]) consonant that can occur at the beginning of the second syllable of a disyllabic VR is the voiced ([+Voiced]) stop ([-Continuant]) /b/. (If, as is usually the case, the vowel that follows the /b/ is [+Nasal], the /b/ is changed to [m] by P 06.) The condition thus permits VRs such as kyima /kíbá/ 'turn, twist', poma /púbá/ 'stick to', home /húbí/ 'rest', or seber(e) /síbít/ 'turn inside out', but excludes VRs that have /p/ or /f/ as the initial consonant of the second syllable. (There are at least two exceptions to the condition, saps(w) /sépèp/ 'become free'--which may be metathesized from paps(w) /pésèp/ 'tug at'--and kamfo /kábfúk/ 'praise'--which is also exceptional in its vowels: cf. subsection (b), above.)

The MS conditions thus far discussed in this subsection limit the initial segment of the second syllable of a disyllabic VR to one of the following six systematic phonemes: /b, t, d, s, k, g/. When this segment is immediately

preceded by a consonant (i.e., when the first syllable of the VR is of the shape /C(V)VC/), there is a further limitation to the following effect:

$$\begin{array}{c} \text{I-TC V4:} \quad \text{VR} [X [-\text{Vocalic}] = [\quad] X] \\ \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \downarrow \\ \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \left[\begin{array}{l} +\text{Coronal} \\ -\text{Continuant} \\ -\text{Voiced} \end{array} \right] \end{array}$$

That is, only the voiceless alveolar stop /t/ may occur in the context in question. Thus VRs such as hinti(w) /hídtip/ 'stumble', kantan /kádtäg/ 'sprawl', or penten /pídtig/ 'jerk' are permitted, but VRs of the shape /CVCbV(C)/, etc. are excluded. (There are a few VRs whose underlying structure appears to be /CVCsV(C)/ or /CVCKV(C)/--e.g., danso(w) 'be unusual', pinkys 'approach'. It is likely, however, that these VRs are compounds--i.e., that there are two morphemes in their underlying structure.)

(d) Of the four possible tone sequences that may occur in the underlying forms of disyllabic morphemes, only two actually do occur when the morphemes are VRs, and, furthermore, these two are in complementary distribution, according to whether the initial consonant of the second syllable of the VR is voiced or voiceless. When this consonant is voiced, the VR has an underlying low-high tone pattern, and when this consonant is voiceless, the VR has an underlying high-low tone pattern. These facts are summarized in the following morpheme-structure condition:

$$\text{PC V3:} \quad \text{VR} \left[X \left[\begin{array}{l} +\text{Vocalic} \\ -\text{Consonantal} \\ -\alpha\text{Tone} \end{array} \right] X = [\alpha\text{Voiced}] \left[\begin{array}{l} +\text{Vocalic} \\ -\text{Consonantal} \\ \alpha\text{Tone} \end{array} \right] X \right]$$

The following are some examples of VRs that conform to PC V3 where $\alpha = +$:

<u>home</u>	/hũbĩ/	'rest'	<u>poma</u>	/pũbã/	'stick to'
<u>huru(w)</u>	/hũdũp/	'jump'	<u>fra</u>	/fĩdã/	'mix'
<u>pene</u>	/pĩdĩ/	'agree'	<u>gyina</u>	/gidã/	'stand'
<u>wie</u>	/wigẽk/	'finish'	<u>boa</u>	/bũgã/	'help'
{Ak-Fa <u>guan</u>	/guàgĩ/	'flee'	{Ak-Fa <u>nan</u>	/dãgĩ/	'melt'
{As <u>dwan(e)</u>			{As <u>nan(e)</u>		

The following are some examples of VRs that conform to PC V3 where $\alpha = -$:

<u>poto(w)</u>	/pũtòp/	'corrupt'	<u>kata</u>	/kãtã/	'cover'
<u>poso(w)</u>	/pũsũp/	'tremble'	<u>bisa</u>	/bĩsã/	'ask'
{Ak-As <u>tie</u>	/tĩkẽ/	'listen'	{ <u>kae</u>	/kãkĩ/	'remember'
{Fa <u>tsie</u>					
{Ak-Fa <u>dan</u>	/dãkĩ/	'turn'	{Ak-Fa <u>man</u>	/bãkĩ/	'turn aside'
{As <u>dan(e)</u>			{As <u>man(e)</u>		

It may be noted from some of the above examples that in the surface segmental form of the VR (which is reflected in the conventional spelling) the distinction between underlying voiced and voiceless medial consonants is sometimes lost. Thus wie ([yĩẽ?]) and t(s)ie (Ak-As [tiẽ]/Fa [tsiẽ]) do not show any medial consonant at all, while As dwane [djuẽnf] and As dane [dãnf] show the same medial consonant. This loss of underlying segmental differences results from the operation of certain P-rules discussed in Section 4.76. The underlying contrast between the voiced and voiceless medial consonants is, however, frequently reflected in the tonal behavior of the VRs. Compare the tone patterns of the following surface forms:

Fa	[òyĩẽ?]	'He finishes.'
Fa	[òtsiẽ]	'He listens.'
As	[òbẽdjuẽnf nũ]	'He will flee to him.'
As	[òbẽdãnf nũ]	'He will turn him.'

There are at least four VRs for which we postulate underlying voiced medial consonants, but which fail to show the expected underlying low-high tone pattern. These VRs, bre /bíðè/ 'bring', tumi /túbí/ 'be able, overcome', kagya(w) /kágàp/ 'wither', and pagya(w) /págàp/ 'raise', constitute exceptions to PC V3. (It would be possible to postulate underlying forms for bre and tumi with medial /t/ and /p/ respectively, but in that case a special account would have to be given of the medial [r] in the surface form of bre while in the case of tumi not only would a special account have to be given of the change of /p/ to [m], but the postulated underlying form would be an exception to I-TC V3--cf. subsection (c), above.)

4.76 Tone Reversal in Disyllabic VRs.

There are various P-rules that change the underlying tones of disyllabic VRs. Most of these rules are syntactically conditioned: e.g., they depend upon the occurrence of the VR with some particular aspect marker, the occurrence of the VR in a dependent clause, etc. Rules of these types are discussed in Sections 4.91 ff. The rule to be discussed in the present section, on the other hand, is not syntactically conditioned, but is, instead, context-independent in some of its applications, phonologically conditioned in others. This is the Akua-pem-Asante rule which changes a high-low tone pattern on a disyllabic VR to Ak low-high, As low-falling. This rule distinguishes between two classes of VRs with underlying high-low tone patterns: those in which the underlying medial consonant of the VR is /k/, and those in which this consonant is /t/ or /s/. As is noted in Section 4.77, subsection (a), a medial /k/ in a disyllabic VR is changed to [g] by P 05 and is then either nasalized by P 06 or deleted by 08, while a medial /t/ or /s/ remains intact. The tone-changing rule under discussion here follows the rules which are responsible for the realization of a VR-medial /k/ as [ŋ] or [Ø], and distinguishes, among VRs with an underlying high-low tone pattern, between, those in which there is a [+Voiced] medial consonant (i.e., [ŋ] ← [g] ← /k/) or no medial consonant (i.e., [Ø] ← [g] ← /k/) and those in which there is a [-Voiced] medial consonant (i.e., /t/ or /s/). In those cases where the underlying form has medial /k/, the rule is completely

context-free. In the case of VRs with medial /t/ or /s/, the rule fails to apply if the VR is immediately preceded by a high tone (e.g., by a future-aspect prefix or an ingressive prefix--cf. Sections 4.34 and 4.50 respectively), but applies in all other cases. Some examples of the operation of the rule are:

Before P 20

[òdánǎ]	'he turns'
[òndánǎ?]	'he doesn't turn'
[òrìdánǎ]	'he is turning'
[òdánǎì]	'he turned'
[òbédánǎ]	'he will turn'
[òkódánǎ]	'he goes and turns'
[òkásà]	'he speaks'
[òṅkásà?]	'he doesn't speak'
[òrìkásà]	'he is speaking'
[òkásàì]	'he spoke'

After P 20

Ak [òdánǎ]/As [òdánǎ]
Ak [òndánǎ?]/As [òndánǎ?]
Ak [òrìdánǎ]/As [òrìdánǎ]
Ak [òdánǎì]/As [òdánǎì]
Ak [òbédánǎ]/As [òbédánǎ]
Ak [òkódánǎ]/As [òkódánǎ]
Ak [òkásà]/As [òkásà]
Ak [òṅkásà?]/As [òṅkásà?]
Ak [òrìkásà]/As [òrìkásà]
Ak [òkásàì]/As [òkásàì]

(The rule fails to apply to, e.g., [òbékásà] 'he will speak', [òkókásà] 'he goes and speaks'. In the case of the latter, note that the rule must precede the Ak-As rule, P 47, which changes high tone on an ING prefix to low, resulting in, e.g., [òkòkásà], the occurring Ak-As surface form in non-pre-pause position.) (For subsequent rules that affect forms like [òdánǎ], resulting in surface forms like Ak [òdánǎ?]/As [òdánǎ] ~ [òdǎǎ], cf. Section 4.77, subsections (b) and (c).)

The effect of P 20 is to make the surface tone patterns of VRs with underlying high-low tone patterns identical with those of VRs with underlying low-high tone patterns. Thus the surface tone pattern of, e.g., Ak-As [òbìsà] 'he asks' (cf. the underlying VR /bìsà/ 'ask') is the same as that of Ak-As [òtçìré] 'he shows' (cf. the underlying VR /kìdè/ 'show'). (In Asante P 20 changes [òbìsà] to [òbìsâ], which is changed to [òbìsà] by P 87.) Apart, however, from the surface tone patterns of certain

forms in which the VR is preceded by a high-tone prefix, there are--in Asante, but not in Akuapem--sometimes other surface indications of the underlying tonal difference between such VRs. For example, Asante has an object-pronoun tone-raising rule, P 17, which operates to change the tone of an object pronoun from low to high when the preceding verb ends in a high tone. It operates, for example, to change the tone of an object pronoun after a VR like /kɪ́s/ to high, but does not affect the tone of an object pronoun after a VR like bisà/. Thus we find in Asante surface tonal contrasts such as:

As [òtɕìrɛ́ nɔ́] 'He shows him.'
 As [òbisá nɔ́] 'He asks him.'

in which the tones of the object pronouns reflect the underlying tonal difference between the VRs, even though the VRs themselves no longer show this difference. (Akuapem does not have the object-pronoun tone-raising rule in question, and there is no surface tonal contrast between Ak [òtɕìrɛ́ nɔ́] and Ak [òbisá nɔ́]. For further discussion of Asante object-pronoun tone-raising, cf. Section 4.95.)

P 20 does not apply in Fante, and therefore Fante surface forms usually show a tonal contrast between VRs with underlying high-low tone patterns and those with underlying low-high tone patterns: e.g., Fa [òkásà] 'he speaks' vs. [òtɕìrɛ́] 'he shows', [ò̀̀kásà?] 'he doesn't speak' vs. [ò̀̀ntɕìrɛ́?] 'he doesn't show', etc.

4.77 Other Rules Affecting Disyllabic VRs.

The following discussion of certain P-rules affecting the segmental forms of disyllabic VRs is arranged as follows: (a) rules affecting medial consonants of disyllabic VRs; (b) rules affecting VRs with final non-vowels; (c) rules affecting disyllabic VRs of the Shape [CVr/m/n/ŋI].

(a) Of the six systematic phonemes which regularly occur at the beginning of the second syllable of a disyllabic VR, /b,t,d,s,k,g/ (cf. Section 4.75, subsection (c)), only two, /t/ and /s/, are always left intact by the

P-rules. The other four are altered by P-rules in some or all cases. The alterations that occur are summarized in the following chart:

<u>Underlying Consonant</u>	<u>Before [+Nasal] Vowel</u>	<u>Before [-Nasal] Vowel</u>
/b/	[m]	No change
/d/	[n]	[r]
/g/	[ŋ]	∅
/k/	[g] → [ŋ]	[g] → ∅

Some of the modifications summarized on the chart are not specific to medial consonants in disyllabic VRs, but, rather, reflect the operation of more general P-rules. Thus the change of /b,d,g/ to [m,n,ŋ] respectively before a [+Nasal] vowel is independent of the grammatical function of the morpheme and occurs in morpheme-initial as well as non-morpheme-initial syllables (cf. P 06). Similarly, /d/ is always changed to [r] intervocalically when the following vowel is [-Nasal] (cf. P 15). Some examples of these changes in disyllabic VRs are:

<u>Before P 06</u>	<u>After P 06</u>
/pũbǎ/ 'stick to'	[pũmǎ]
/pĩdǎ/ 'agree'	[pĩnǎ]
/dǎgǎ/ 'melt'	[nǎŋǎ]
<u>Before P 15</u>	<u>After P 15</u>
/fĩdǎ/ 'call'	[fĩrǎ]

(For subsequent P-rules that affect forms like [pĩnǎ] and [nǎŋǎ], cf. subsection (c), below.)

As the chart indicates, underlying medial /b/ in a VR remains intact when the following vowel is [-Nasal]. Thus corresponding to the underlying form /sĩbĩt/ 'turn inside out' we have the surface forms Ak-As [sĩbĩrĩ], Fa [sĩbĩr?]. (It may be noted, however, that in the great majority of cases the vowel following a medial /b/ in a disyllabic VR is [+Nasal].)

Underlying medial /g/ in a disyllabic VR (and possibly in morphemes of other types) is deleted before a single [-Nasal] vowel by means of P 08. Some examples of the operation of this rule are:

<u>Before [g] Deletion</u>		<u>After [g] Deletion</u>
/bùgá/	'help'	[bùá]
/wìgék/	'finish'	[wìék]

(Examples like Ak pagyaw [pédjèw?] (underlying form: /pégèp/) 'raise' show that the [g]-deletion rule must follow the [I]-insertion rule, P 07, which inserts an [I] between a [g] and a low tense vowel. [I] insertion, by changing [pégèw] (derived from /pégèp/ by P 03) to [pégièw], protects the medial [g] from deletion by P 08, since [g] is not deleted before a [VV] sequence.

Underlying medial /k/ in a disyllabic VR is first changed to [g] by means of P 05. Thereafter it is treated like an underlying /g/ occurring in this position: that is, it is changed to [ŋ] when followed by a [+Nasal] vowel (by P 06), and it is deleted when followed by a [-Nasal] vowel (by P 08). Some examples are:

<u>Before</u> <u>/k/ → [g]</u>		<u>After</u> <u>/k/ → [g]</u>	<u>After</u> <u>Nasalization</u>	<u>After</u> <u>[g]-Deletion</u>
/dákĩ/	'turn'	[dágĩ]	[dánĩ]	
/bǎkĩ/	'turn aside'	[bǎgĩ]	[mánĩ]	
/kákì/	'remember'	[kágì]		[kài]
/tíkè/	'listen'	[tígè]		[tiè]

(In Akuapem and Asante, the forms in the last two columns would, in most contexts, have a low-high, rather than a high-low, tone pattern, as the result of the operation of the tone-reversal rule discussed in Section 4.76. For further rules affecting forms like [dánì] and [mánĩ], cf. subsection (c) below.) (There are several exceptions to the postulated /k/ → [g] rule: e.g., buka(w) /búkàp/ 'bend', sekys(w) /síkèp/ 'waste'. It is possible, however, that further analysis will show that these are compounds.)

(b) Final non-vowels in disyllabic VRs trigger some of the same P-rules as final non-vowels in monosyllabic VRs (cf. Sections 4.72 through 4.74). In particular, the following rules may apply to disyllabic, as to monosyllabic, VRs: (1) P 29, which, in Asante and some Fante dialects, replaces a VR-final [w] by [ʔ]; (2) P 31, which adds [ĩ] or [ũ] after a VR-final non-vowel; (3) P 01, which spreads the low tone of the added [ĩ] or [ũ] to the preceding non-vowel; (4) P 33, which replaces the added vowel by [ʔ] in certain cases: viz, after [m] or [ŋ] in all dialects (except that in Asante the replacement after [ŋ] is optional), after [w] in Akuapem and those Fante dialects in which a VR-final [w] has been retained, and after [r] or [n] in Fante only; (5) P 70, which changes final or intervocalic [ŋ] to [n] in Fante, and intervocalic [ŋ] to [n] in Asante; (6) P 71, which changes final [ŋʔ] to a nasalized close vowel in Asante. Some examples of the operation of these rules on disyllabic VRs are shown on the following page (p. 201). (The two Asante forms that develop from the input form [wũrán] result from the fact that the [V] → [ʔ] rule is optional in Asante when the consonant preceding the [V] is [ŋ]. If the option is not exercised, then the [ŋ] → [n] rule operates upon [wũránʔ] to yield [wũránĩ]. If the option of applying the [V] → [ʔ] rule is exercised, the form that results, [wũránʔ], undergoes the [ŋʔ] → [ĩ] rule, which results in the form [wũráĩ]. Various subsequent rules may apply to the forms listed-- e.g., the pre-pause tone-raising rule, P 68, which accounts for the final high tone on Ak/Fa¹ [bũrúwʔ], etc. in pre-pause position, or the nasalization-spreading rule, P 73, which changes As [wũráĩ] to [wũráĩ̃].)

(c) Disyllabic VRs whose second syllable, in the course of the P-rules, assumes the shape [r], [m], [n] or [ŋ] plus [I], undergo certain subsequent dialect-specific rules which account for surface dialect differences such as: Ak-As [fèrí]/Fa [fèríʔ] 'respect' (underlying form: /fèdí/); Ak-As [hũmĩ]/Fa [hũmʔ] 'breathe' (underlying form: /hũbí/); Ak-As [pĩnĩ]/Fa [pĩnʔ] 'agree' (underlying form: /pĩdí/); Ak [nǎŋʔ]/As [nǎnĩ] ~ [nǎĩ]/Fa [nǎnʔ] 'melt' (underlying form: /dǎgĩ/). These dialect differences result

(0) Input Form	[bùrúw] 'demolish'	[sìbíř] 'turn inside out'	[hàráǎ] 'yawn'	[wùráǎ] 'scratch'
(1) [w] → [ʔ]	As Fa ₂ [bùrúʔ]			
(2) Vowel Addition	Ak ₁ Fa [bùrúwù]	[sìbířì]	[hàráǎř]	[wùráǎř]
(3) Tone Spreading	Ak ₁ Fa [bùrúwù]	[sìbířì]	[hàráǎř]	[wùráǎř]
(4) [V] → [ʔ]	Ak ₁ Fa [bùrúwʔ]	Fa [sìbířʔ]	[hàráǎʔ]	[wùráǎʔ]
(5) [ŋ] → [n]				Fa [wùráǎʔ] As [wùráǎř]
(6) [ŋʔ] → [ĩ]				As [wùráǎř]

from the application of the same dialect-specific rules that apply to other VR-final sequences of [r], [m], [n], or [ŋ] plus [I] (i.e., sequences in which the [I] has been introduced by the vowel-addition rule--cf. subsection (b), above, and Section 4.73). These rules are: the [V] → [ʔ] rule (P 33), the [ŋ] → [n] rule (P 70), and the [ŋʔ] → [V] rule (P 71).

In Fante, the V → [ʔ] rule obligatorily replaces a final [I] in a polysyllabic VR by [ʔ] after any one of the non-vowels [r], [m], [n], or [ŋ]. In the other two dialects, the replacement occurs only after [ŋ], obligatorily in Akuapem, optionally in Asante. (Note that, while the V → [ʔ] rule leaves intact a final [I] that follows an [m] in Akuapem and Asante, it does replace by [ʔ] a final [U] that follows an [m] in these dialects. In those cases where the vowel following [m] has been introduced by the vowel-addition rule, the added vowel is always [U], and hence is replaced by [ʔ] in all dialects. Thus, in Akuapem and Asante, as in Fante, [pám] 'sew' → [pámʔ] → [pámʔ]. Similarly, in the case of a disyllabic VR with a final [mũ] sequence, the [ũ] is replaced by [ʔ] in all dialects. Thus [pámũ] 'drive away' (underlying form: /pábũ/) → [pámʔ] not only in Fante, but in Akuapem and Asante as well.) This difference in the operation of the [V] → [ʔ] rule accounts for such dialect differences as that between Ak-As [fèrí] and Fa [fèríʔ], Ak-As [hũmí] and Fa [hũmíʔ], and Ak-As [píní] and Fa [píníʔ].

It is in the treatment of [ŋí] sequences (in the second syllable of disyllabic VRs) that the three dialects show the greatest diversity. In Akuapem, once the [V] → [ʔ] rule has applied to, e.g., [nǎŋí] to yield [nǎŋʔ], no further rules apply. In Asante, if the option of applying the [V] → [ʔ] rule to a form like [nǎŋí] is not exercised, the [ŋ] → [n] rule obligatorily applies, yielding [nǎní], while if the option of applying the [V] → [ʔ] rule is exercised, then the resultant form [nǎŋʔ], is obligatorily changed to [nǎní] by the [ŋʔ] → [V] rule. In Fante, the [ŋ] → [n] rule obligatorily applies to [nǎŋʔ], yielding [nǎníʔ].

4.78 Trisyllabic VRs.

The list of Akan trisyllabic VRs is a very short one. It consists of boapa 'do on purpose', bransam 'embrace', brantam 'bend', patiri(w)/watiri(w) 'slide', Ak sakra/As sakvera (cf. Fa sakyer) 'change', Ak samana (cf. As-Fa saman) 'summon', and perhaps a few other items. It seems likely that all of these VRs are derived formations or borrowings (e.g., samana is borrowed from English). Until further information about the internal structure or provenience of these forms is obtained, however, it seems best to simply list them in the lexicon as exceptional. Such a treatment of the trisyllabic VRs permits one to state a positive morpheme-structure condition to the following effect:

PC V4: VR[X = (X)]

(where X does not include a syllable-boundary (=), and where the parentheses indicate an optional element). That is, all regular VRs have either one or two syllables.

4.79 Final Glottal Stop in VRs.

There are many VRs, both monosyllabic and disyllabic, which, in their surface forms, have a final glottal stop when they occur before a pause. In most cases, these final glottal stops are introduced by P-rules in which the glottal stop replaces the final segment of the input form, which may be either a vowel or a non-vowel. There are, however, certain occurrences of final glottal stop which apparently cannot be explained in this way. The discussion of VR-final glottal stops below is arranged as follows: (a) [ʔ] replacing a VR-final vowel; (b) [ʔ] replacing a VR-final non-vowel; (c) other VR-final [ʔ]s. (The material presented under (a) and (b) is for the most part a summary of material presented more fully in preceding sections.)

(a) When the surface form of a VR ends, in pre-pause position, in a non-vowel plus a glottal stop, the glottal stop always represents a replacement for a final vowel. The rule that effects this replacement is the [V] → [ʔ] rule, P 33. The replaced vowel is always one of

the close (i.e. [+High]) vowels [I] and [U], and the non-vowel that precedes it (at the point in the rules at which the [V] → [ʔ] rule applies) is always one of the following: [w], [r], [m], [n], or [ŋ]. The [I] or [U] that is replaced by the glottal stop may or may not have been present in the underlying form of the VR. If this vowel comes from the underlying form, then the underlying form is a disyllabic VR whose second syllable is of the shape /CV/. If the vowel does not come from the underlying form, then the underlying form is either a monosyllabic VR of the shape /CVC/ or a disyllabic VR with a second syllable of this shape, and the vowel that is replaced by the glottal stop has been added by the vowel-addition rule, P 31.

The [V] → [ʔ] rule applies least widely in Asante, somewhat more widely in Akuapem, and most widely in Fante. In Asante, the rule applies obligatorily only to a VR whose final syllable (at the appropriate point in the rules) is of the shape [mU] ([mũ] or [mũ]); it also applies optionally to a VR whose final syllable has the shape [ŋI] ([ŋĩ] or [ŋĩ]). In Akuapem, the rule applies obligatorily to VRs with final syllables of the shape [mU], [ŋI], and [wU]. In Fante, the rule applies obligatorily to any VR-final [CV] syllable in which [C] = [w], [r], [m], [n], or [ŋ] and [V] = [I] or [U], (except that [C] ≠ [w] in those Fante subdialects in which the [w] → [ʔ] rule is obligatory--cf. subsection (b) below). Some examples are:

<u>Underlying Form</u>	<u>Before [V] → [ʔ]</u>	<u>After [V] → [ʔ]</u>
/háp/ 'trouble'	Ak/Fa ¹ [háwù]	Ak/Fa ¹ [háwʔ]
	(cf. As/Fa ² [háʔ])	
/jít/ 'overflow'	[jířì]	Fa [jířʔ]
		(cf. Ak/As [jířì])
/dũb/ 'drink'	[nũmũ]	[nũmʔ]
/hũbĩ/ 'breathe'	[hũmĩ]	Fa [hũmʔ]
		(cf. Ak/As [hũmĩ])
/tũd/ 'forge'	Fa [tũnũ]	Fa [tũnʔ]
	Ak/As [tũnũ]	(cf. Ak/As [tũnũ])
/wũdág/ 'scratch'	[wũránĩ]	[wũránʔ]
		As ~ [wũránĩ]

(Various subsequent rules may apply to the forms shown in the third column. For details, see the preceding sections.)

(b) When the surface form of a VR ends, in pre-pause position, in a vowel plus a glottal stop, the glottal stop usually represents a replacement for a final non-vowel. (For exceptions, cf. subsection (c), below.) There are three P-rules which replace VR-final non-vowels by [ʔ]. These are: the /k/ → [ʔ] rule (P 03); the [w] → [ʔ] rule (P 29); and the [r,m,n] → [ʔ] rule (P 30).

The /k/ → [ʔ] rule applies in all dialects. The rule operates to replace a final /k/ in an underlying form by [ʔ]. Some examples of the operation of the rule are:

Before /k/ → [ʔ]		After /k/ → [ʔ]	
[pàk]	'remove'	[pàʔ]	
[sík]	'stand'	[síʔ]	
[púsàk]	'rub'	[púsàʔ]	
[fútùk]	'mix'	[fútùʔ]	

(Since the /k/ → [ʔ] rule applies in all cases, surface forms for which we postulate a final /k/ do not actually provide evidence as to the nature of the underlying final consonant. Our reason for postulating that this underlying consonant is /k/ is that doing so permits us to state a morpheme structure condition (SqSC 2, Section 2.21) to the effect that a morpheme-final non-vowel may be any one of the stop ([-Continuant]) consonants /p,t,k,b,d,g/ and only these. Since morpheme-final /p/, /t/, /b/, /d/, and /g/ are attested in surface forms in at least some dialects (as [w], [r], [m], [n], and [ŋ] respectively), /k/ is the most plausible source for post-vocalic final [ʔ] in surface forms such as [pàʔ], [síʔ], etc.)

The [w] → [ʔ] rule applies in Asante and some Fante subdialects (Fa²). The rule operates to replace a final [w] (which is derived from an underlying final /p/) by [ʔ]. Some examples are:

<u>Before [w] → [ʔ]</u>	<u>After [w] → [ʔ]</u>
[dów] 'weed'	As/Fa ² [dóʔ]
[háw] 'trouble'	As/Fa ² [háʔ]
[pìréw] 'touch lightly'	As/Fa ² [pìréʔ]
[sìríw] 'laugh'	As/Fa ² [sìríʔ]

(In those dialects--Akuapem and Fa¹--in which the [w] → [ʔ] rule does not apply, forms with final [w] obligatorily undergo the vowel-addition and [V] → [ʔ] rules, which result in surface forms in which [w] is followed by [ʔ]--cf. subsection (a), above.)

The operation of the [r,m,n] → [ʔ] rule has been explained in detail in Section 4.72. In Akuapem and Fante, the rule applies obligatorily to a small set of monosyllabic VRs with final [r] or [n]. (The detailed workings of the rule differ in the two dialects.) In Asante, the rule apparently may apply to any monosyllabic VR with final [r] or [n], and to the majority of monosyllabic VRs with final [m], but its application is in most cases optional. Some examples of the operation of the rule are:

<u>Before [r,m,n] → [ʔ]</u>	<u>After [r,m,n] → [ʔ]</u>
[kór] 'go'	[kóʔ]
[húr] 'wash'	As [húʔ]
[hĩm] 'blow the nose'	As [hĩʔ]
[hũn] 'see'	[hũʔ]
[pĩn] 'pinch'	As [pĩʔ]

(c) There are a good many VRs whose surface forms end in vowel-plus-[ʔ] in Akuapem, but simply end in a vowel in Asante and Fante, e.g.,

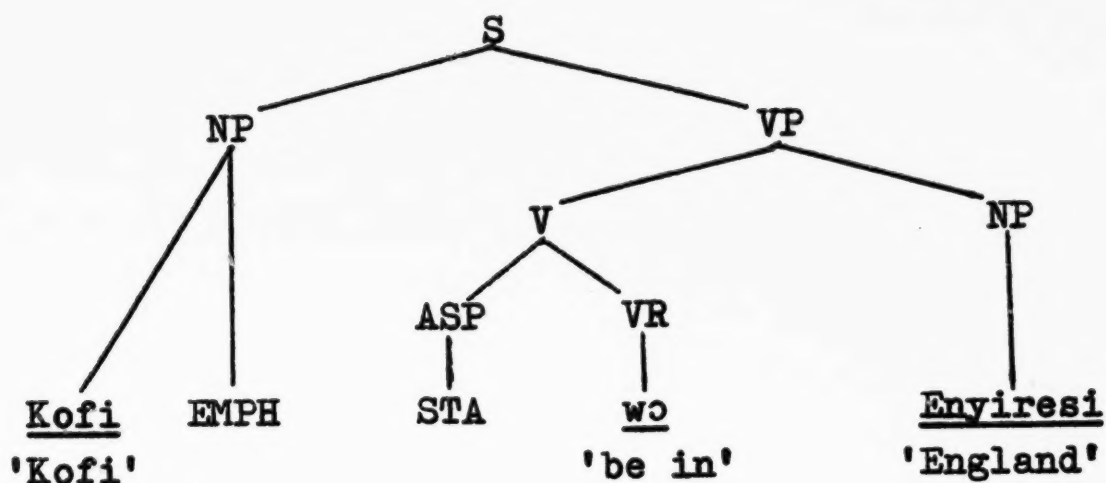
Ak [bóʔ]/As-Fa [bó] 'beat'
 Ak [tcéʔ]/As-Fa [tcé] 'divide'
 Ak [kāʔ]/As-Fa [kā] 'say'
 Ak [sũʔ]/As-Fa [sũ] 'be big'.

The origin of the glottal stop in these Akuapem forms is not clear. Were an underlying final /k/ to be postulated for them (cf. subsection (a), above), one would expect that the surface forms would show a final [ʔ] not only in Akuapem but in the other two dialects as well.

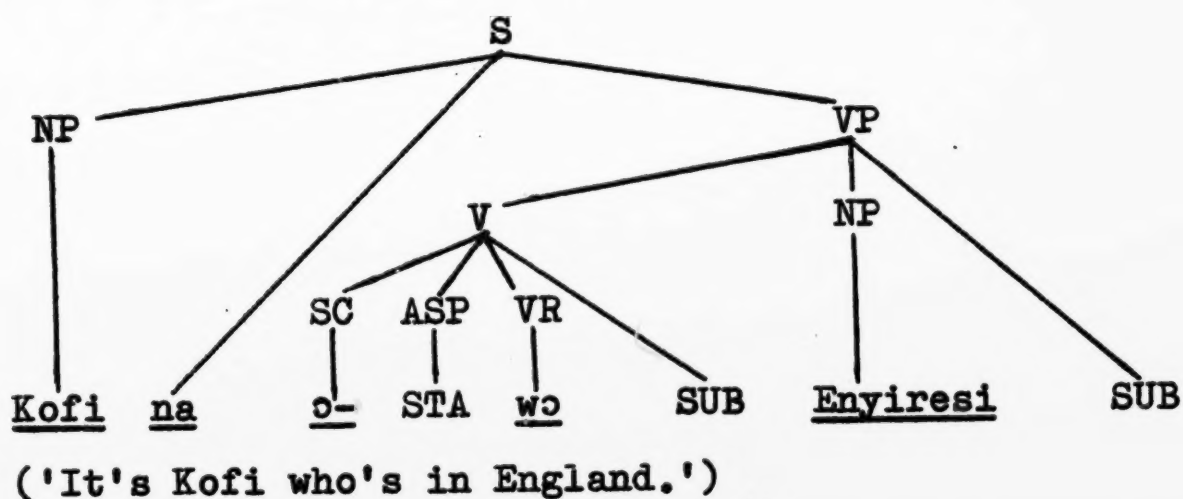
Our tentative assumption is that Akuapem is in the process of generalizing the use of a pre-pausal [ʔ] as a marker of the entire set of VRs. (In this connection, it may be noted that very few nouns in Akuapem--or in the other dialects--have a final [ʔ].) One Akuapem informant with whom we have worked, for example, uses a final glottal stop in all but about a dozen of a list of over two hundred monosyllabic VRs. However, since there clearly exist VRs in which Akuapem speakers do not use a final glottal stop--e.g., [bá] 'come', [çyé] 'look at', [wú] 'die'--it is not possible to postulate an entirely general rule that adds a [ʔ] at the end of a VR with a final vowel. Instead, it seems to be necessary to assign a rule feature to those VRs that show the added [ʔ] in Akuapem (or, alternatively, to assign a negative rule feature to those that do not show the added [ʔ]), and to postulate an Akuapem rule (P 82) that is dependent upon this feature.

4.80 SUBordinative.

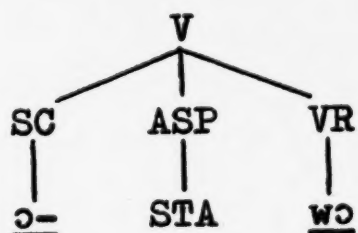
The SUBordinative (which is identical to what Stewart calls the 'subjunctive', and which is associated with what Christaller calls the 'connected forms' of verbs) does not occur in deep structures. It is introduced into surface structures by means of transformations that apply to certain clauses that are syntactically and/or semantically subordinate to some preceding sentence element: e.g., relative clauses and clauses following the emphatic marker na (which emphasizes what precedes it). These transformations operate to introduce the formative SUB at each of two points in the subordinated clause: (1) as a constituent (in our formulation, the final constituent) of V; and (2) as the final constituent of the VP. For example, the na-emphasis transformation (together with the subject-concord transformations discussed in Section 4.20) would operate upon a deep structure such as:



to yield the derived structure:



The SUB that occurs as a constituent of V never has any segmental realization. Its presence in a V does, however, trigger certain tone-changing P-rules, such that a subordinated V is in most cases tonally different from the same V in an independent clause. For example, in an independent clause, the configuration:



is realized with low tone on both the subject-concord prefix o- and the VR wo. Thus:

Òwò Ényirési 'He is in England'

When SUB is present in the V, on the other hand, the tones of the subject-concord prefix (in Akuapem and Fante) and the VR (in all dialects) are changed to high. Note the tones on owó in:

{	Ak-Fa	<u>Kòfí</u> nà <u>ówó</u> <u>Ényirési</u>	}	'It's Kofi who's in England'
	As	<u>Kòfí</u> nà <u>ówó</u> { <u>Ényirésié</u> <u>Ényirési</u> }		

As the last example shows, the SUB that occurs as the final constituent of the VP has (in some cases) different realizations in, on the one hand, Akuapem and Fante, and, on the other, Asante. In Akuapem and Fante, a VP-final SUB, like a V-final SUB, lacks a segmental realization. It is realized, instead, as a final high tone added to the last syllable of the VP: compare the tones on Ényirési in the independent and subordinate clauses above. (For an account of how the added high tone in the subordinate clause results in a final mid tone in the surface form of Ényirési, see the discussion in Section 4.81. In Asante, a VP-final SUB is in some cases realized, either obligatorily or optionally, as a high-tone vowel suffixed to the last syllable of the V: compare Ényirési in the independent clause with Ényirésié at the end of the subordinate clause above.

The P-rules that change the tones of Vs that include SUB follow various other P-rules that affect the tones of Vs, and are discussed in detail together with these other P-rules in Section 4.96. The P-rules that account for the surface realizations of the VP-final SUB are discussed in the immediately following section.

4.81 Rules Affecting VP-Final SUB.

The various surface forms of VP-final SUB are all derived, by means of P-rules, from a suffix which is listed in the lexicon as a high-tone mid vowel unspecified as to frontness, tenseness, or nasality. That is, the vowel is [-High, -Low, +Tone] but is unspecified for the features [+Back], [+Tense], and [+Nasal]. The suffix attaches to the last word of the VP. The P-rules that apply to the suffixed vowel (and, in some cases, to the syllable

preceding the suffixed vowel) are: (a) SUB-deletion (P 39); (b) vowel harmony in SUB (P 40); (c) tone-raising before SUB (P 41). Of these rules, only (a) operates in all dialects (although the details of operation show dialect differences--see below); (b) and (c) operate in Asante only.

(a) The SUB-deletion rule, P 39, deletes all of the segmental features of the VR-final SUB suffix, and adds the high tone of the suffix at the end of the immediately preceding syllable. If this syllable had high tone before the addition of the high tone from SUB its surface tone is unaffected by the added tone. Compare the final tones in:

	<u>Kòfí wò Àsànté</u>	'Kofi is in Asante.'
{	Ak-Fa <u>Kòfí nà ówó Ásànté.</u>	'It's Kofi who's in Asante.'
	As <u>Kòfí nà òwó Ásànté.</u>	

(For an account of the raising of verb tones in the presence of SUB, cf. Section 4.96. The tones of noun prefixes, such as the A- of Asante, are normally raised after high tones.) If, however, the syllable preceding SUB had low tone before the addition of the high tone from SUB, this low tone becomes a rising tone, which, in surface forms, is realized either as a high tone (if the tone before the rising tone is low) or as a mid tone (if the tone before the rising tone is high). (For details of the replacement of a rising tone by high or mid tone, cf. the discussion in Section 3.93.) Compare the final tones in:

	<u>Kòfí wò Nkràñ.</u>	'Kofi is in Accra.'
{	Ak-Fa <u>Kòfí nà ówó Nkràñ.</u>	'It's Kofi who's in Accra.'
	As <u>Kòfí nà òwó Nkràñ.</u>	

and in:

	<u>Kòfí wò Ényirési.</u>	'Kofi is in England.'
{	Ak-Fa <u>Kòfí nà ówó Ényirési.</u>	'It's Kofi who's in England.'
	As <u>Kòfí nà òwó Ényirési.</u>	

In Akuapem and Fante, the SUB-deletion rule obligatorily applies in all cases, whatever the form of the syllable preceding SUB. In Asante the SUB-deletion rule obligatorily applies in all cases in which the syllable before SUB does not end in a close vowel (i.e., whenever this syllable ends in /A/, /E/, /O/, or in a non-vowel). When the syllable before SUB ends in a close vowel (/I/ or /U/), the SUB-deletion rule fails to apply in some cases, applies obligatorily in others, and in still others applies optionally.

There is a good deal of subdialectal variation within Asante governing the applicability or non-applicability of the SUB-deletion rule in cases where the syllable before SUB ends in a close vowel. There is also subdialectal variation, in those cases where the rule does apply, with regard to whether application is optional or obligatory. In the case of the Asante speaker whose usage in this area we have studied most closely, the facts appear to be these:

(a.1) SUB-deletion never applies when the preceding close vowel is in a verb, an object pronoun, or one of the words bi 'some', no 'the/that', yi 'this'. Thus, for this speaker, SUB-deletion does not occur in cases such as the following:

- | | |
|---|---|
| As <u>Kofi na obetoo.</u> | 'It's Kofi who will throw it.' |
| (cf. As <u>Kofi beto.</u> | 'Kofi will throw it.') |
| As <u>Kofi na obisaa mee.</u> | 'It's Kofi who asked me.' |
| (cf. As <u>Kofi bisaa me.</u> | 'Kofi asked me.') |
| As <u>Kofi na odii bie.</u> | 'It's Kofi who ate some.' |
| (cf. As <u>Kofi dii bi.</u> | 'Kofi ate some.') |
| As <u>Kofi na ohuu baa</u> $\left\{ \begin{array}{l} \underline{noo.} \\ \underline{yie.} \end{array} \right\}$ | 'It's Kofi who saw $\left\{ \begin{array}{l} \text{the/that} \\ \text{this} \end{array} \right\}$ woman.' |
| (cf. As <u>Kofi huu baa</u> $\left\{ \begin{array}{l} \underline{no.} \\ \underline{yi.} \end{array} \right\}$ | 'Kofi saw $\left\{ \begin{array}{l} \text{the/that} \\ \text{this} \end{array} \right\}$ woman.') |

As Kofi na ohuu Kwaku. 'It's Kofi who saw Kwaku.'
(cf. As Kofi huu Kwaku. 'Kofi saw Kwaku.')

*Kofi na ohuu Kwakuo.

As Kofi na ɔwɔ $\left\{ \begin{array}{l} \underline{\text{Kumase.}} \\ \underline{\text{Kumaseɛ.}} \end{array} \right\}$ 'It's Kofi who's in Kumase.'
(cf. Kofi wɔ Kumase. 'Kofi is in Kumase.')

As Kofi na odii $\left\{ \begin{array}{l} \underline{\text{biribi.}} \\ \underline{\text{biribie.}} \end{array} \right\}$ 'It's Kofi who ate something.'
(cf. Kofi dii biribi. 'Kofi ate something.')

Final glottal stops are never present in the surface forms of clauses that include SUB. In the surface forms of clauses (or sentences) that do not include SUB, final glottal stops generally have one of two origins: they may be reflexes of particular morphemes such as the NEGATIVE (cf. Section 4.40); or they may serve as replatives for VR-final segments of various types (cf. Section 4.79). For example, in:

{ Ak [kòfí mǐ kùǎsí?] }
 { As [kòfí mǐ kùǎsí?] } 'Kofi isn't from Kumase.'
 { Fa [kòfí mǐ kùǎsí?] }

[kòfí fì kùṁásí] 'Kofi is from Kumase.')

(For an account of the dialect differences in the tone of the negative-stative verb mfi, cf. Section 4.92, subsection (a).) On the other hand, in:

[kòfí ṅkɔʔ]

'Kofi should go.'

the final glottal stop is a replacive for the final consonant present in the underlying form of a VR. (The underlying form of the VR in this case is /kɔt/ 'go'. This is changed to [kɔr] by P 03, and then to [kɔʔ] by P 30.)

Whatever the origin of a glottal stop, it may occur only in a position immediately before a pause. For example, the glottal stop at the end of the surface form [ṅkɔʔ] 'should go' in pre-pause position is not found in:

[kòfí ṅkɔ kùṁǎsí]

'Kofi should go to Kumase.'

The reason for this is that there is a P-rule, P 04, that deletes any [ʔ] that is not followed by [,] or [.] (i.e., phrase or sentence boundary). Now it is precisely this rule which accounts for the absence of [ʔ] at the end of clauses that include SUB. At the point in the P-rules at which the [ʔ]-deletion rule applies, a VR-final SUB has the form of a suffixed vowel, and any glottal stop that precedes it is therefore deleted. The SUB-deletion rule itself comes at a later point in the rules: i.e., after the deletion of any [ʔ] that may have preceded it. This ordering is apparent in the absence of a final [ʔ] in, e.g.

[kòfí nǎ ɔṅkɔ]

'It's Kofi who should go.'

(b) As was noted in subsection (a), above, a VR-final SUB is always deleted in Akuapem and Fante, but is sometimes retained in Asante when it immediately follows a close vowel. When SUB is retained, it has the form of a suffixed vowel: originally, a vowel with the features [-High, -Low, +Tone] and with other features unspecified. In surface forms, the backness, tenseness, and nasality features of the SUB suffix always agree with those of the preceding vowel. This agreement is accomplished by means of P 40, which copies the appropriate features of the preceding vowel onto the vowel of SUB. By means of this rule, the SUB suffix is specified as [e]

after [i], [ɛ] after [ɪ], [o] after [u], and [ɔ] after [ʊ]. When the preceding vowel is [+Nasal], P 40 first specifies the suffixed vowel as [ẽ], [ɛ̃], [õ], and [ɔ̃] after [ĩ], [ĩ̃], [ũ], and [ũ̃] respectively, but a second part of the rule changes the suffixed vowel from a mid to a close vowel, so that in the surface form the suffixed vowel is identical with the preceding vowel. Examples of the operation of the P 40 follow. The "SUB" in the first column represents in each case a [-High, -Low, +Tone] vowel unspecified for other features.

<u>Before P 40</u>		<u>After P 40, Part 1</u>	<u>After P 40, Part 2</u>
As [bédí]	+ SUB	[bédíé]	
'will-eat'			
As [bétçí]	+ SUB	[bétçíẽ]	[bétçíĩ]
'will-squeeze'			
As [béfí]	+ SUB	[béfíé]	
'will-vomit'			
As [bésí]	+ SUB	[bésíẽ]	[bésíĩ]
'will-stick-to'			
As [bébú]	+ SUB	[bébúó]	
'will-bend'			
As [béhú]	+ SUB	[béhúõ]	[béhúũ]
'will-see'			
As [bétú]	+ SUB	[bétúó]	
'will-throw'			
As [bétũ]	+ SUB	[bétũõ]	[bétũũ]
'will-twist'			

(a) In those cases where the VR-final SUB suffix is not deleted in Asante, the tone of the preceding close vowel is in some cases affected by the presence of the suffix. Specifically, a low tone before the SUB suffix is in some cases changed to high by means of P 41. Apparently this change occurs only in those cases where the retention of the suffix is obligatory (cf. subsection (a.1), above): i.e., when the constituent immediately before SUB is a

verb, an object pronoun, or one of a limited number of other morphemes such as bi 'some'. In those cases, on the other hand, where the retention of the SUB suffix is optional (cf. subsection (a.3), above), a low tone preceding SUB is not changed to high. Thus there is a change of tone on the object pronoun in:

As [kòfí nǎ òbísáà mǐí] 'It's Kofi who asked me.'
 (cf. As [kòfí bisáà mǐ] 'Kofi asked me.')

and on bi in:

As [kòfí nǎ òdii bié] 'It's Kofi who ate some.'
 (cf. As [kòfí dii bi] 'Kofi ate some.')

But the low tone preceding the SUB suffix remains low in:

As [kòfí nǎ òwó épírésíé] 'It's Kofi who is in England.'
 (cf. As [kòfí wò épírésí] 'Kofi is in England.')

As [kòfí nǎ òkó pù] 'It's Kofi who has gone to sea.'
 (cf. As [kòfí kó pù] 'Kofi has gone to sea.')

4.90 Tone-Changing P-Rules.

The remaining sections of this chapter are devoted to a discussion of certain P-rules that change the tone patterns of verbs (and, in some cases, other VP constituents). Attention is focused primarily upon P-rules whose operation depends upon certain sequences of constituents of the VP: e.g., some particular aspect prefix plus some particular type of Verb Root. (Many of the tone-changing P-rules that apply to individual constituents, rather than to constituent sequences, have been discussed in preceding sections.) The discussion is arranged as follows: tone changes in affirmative simple Vs (Section 4.91); tone changes in negative simple Vs (Section 4.92); tone changes in ingressive Vs (Section 4.93); tone changes in reduplicated Vs (Section 4.94); tone changes in verb-plus-pronoun constructions (Section 4.95); tone changes in subordinative Vs (Section 4.96).

4.91 Tone Changes in Affirmative Simple Vs.

For the purposes of this and the following section, a "simple" V is one that does not include an ingressive, reduplicative, or subordinative morpheme. A simple affirmative V thus normally has the shape SC + ASP + VR; a simple negative V, the shape SC + ASP + NEG + VR. (In the case of the affirmative past and the negative perfect, which are formed with an aspectual suffix rather than a prefix (cf. Sections 4.33 and 4.41), the simple Vs have the shapes SC + VR + ASP and SC + NEG + VR + ASP respectively.) The following discussion of tone-changing P-rules that apply to affirmative simple Vs is arranged according to the particular affix involved: (a) STative; (b) HABitual; (c) PROgressive; (d) PAST; (e) PERFect; (f) FUTure; (g) OPTative; (h) IMPerative; (i) CONsecutive.

(a) STA. As is noted in Section 4.31, the STative-aspect morpheme has no segmental surface form. STA does, however, trigger certain P-rules that may change the tone of other elements of the V. In the case of affirmative-stative forms, only one such rule applies. This is P 43, which makes the tone(s) on the vowel(s) of a VR that follows STA low. The effect of P 43 is illustrated by the surface tone patterns of the following affirmative-stative forms:

<u>òfi</u>	'he is from'	<u>òkùrà</u>	'he is holding'
<u>òhyè</u>	'he is wearing'	<u>òfàtà</u>	'he deserves'

(Before application of P 43, the VRs in these examples show the following tones: fì, hyé, kùrá, fàtà.)

(There are two stative verbs, Ak-As ne/Fa nye 'be' and Ak-Fa ye/As ye 'be good', that are tonally irregular. Both these verbs require high tone on the VR, and ne/nye requires high tone on a preceding SC as well.)

(b) HAB. Like STA, the HABitual-aspect morpheme has no segmental surface form. In the lexicon, however, HAB is marked as carrying low tone. (The low tone on HAB is postulated in order to account for the application of P 16 and P 50 to forms that include it--see below.) While HAB does not, in general, trigger P-rules (that is, HAB need not, in general, be mentioned in P-rules), there

are certain P-rules that apply to forms that include HAB as well as to forms that include a number of other ASP morphemes. These are: P 19, P 50, P 16, and P 20.

P 19 is the rule that changes a low tone on a monosyllabic VR to high (cf. discussion in Section 4.71). The rule applies obligatorily in Akuapem and Asante, and optionally in certain Fante subdialects. (In other Fante subdialects P 19 does not apply.) Examples of the application of P 19 to affirmative forms that include HAB are:

<u>Before P 19</u>	<u>After P 19</u>
<u>òfà</u> 'he takes'	<u>òfá</u>
<u>òkò</u> 'he fights'	<u>òkó</u>

P 50 changes certain low-high tone sequences on Vs that include monosyllabic VRs to high-low. It operates in Akuapem and Fante but not in Asante. It applies whenever a low-tone aspectual prefix is immediately followed by a monosyllabic VR with high tone (if the VR is not, in turn, followed by a suffix). The high tone on the VR in the input to P 50 may be inherent (as in the case of bá 'come', hwé 'look at') or may, in Akuapem (and some Fante subdialects), result from the prior application of P 19 (see above). Examples of the application of P 50 to forms that include HAB are:

<u>Before P 50</u>	<u>After P 50</u>
<u>òbá</u> 'he comes'	Ak-Fa <u>óbà</u>
<u>òhwé</u> 'he looks at'	Ak-Fa <u>óhwè</u>
Ak <u>òfá</u> 'he takes'	Ak <u>ófà</u>
Ak <u>òkó</u> 'he fights'	Ak <u>ókò</u>

P 16 applies only in Asante. It adds a low tone at the end of a high-tone monosyllabic VR that is immediately preceded by an aspectual prefix with low tone. Examples of its application to affirmative habitual forms are:

<u>Before P 16</u>	<u>After P 16</u>
<u>òbá</u> 'he comes'	As <u>òbâ</u>
<u>òhwé</u> 'he looks at'	As <u>òhwê</u>

(The falling tones that result from the application of P 16 are later changed back to high tones by P 87. The occurrence of falling tones on the VRs before the application of P 87 is, however, sometimes attested by the surface tone pattern of the word that follows the verb. For example, if this item has underlying initial high tone, its surface initial tone is mid after a verb to which P 16 has applied. Consider, for example, the following Asante derivation: òbá Ghána 'he comes to Ghana' → òbá Ghána (by P 16) → òbá Ghána (by P 86) → òbá Ghána (by P 87).)

P 20 applies in Akuapem and Asante, but not in Fante, to disyllabic VRs whose inherent tone pattern is high-low (cf. discussion in Section 4.76). It operates to change this high-low pattern to low-high in Akuapem and low-falling in Asante, except when the syllable immediately preceding the VR has high tone. Examples of its application to forms that include HAB are:

<u>Before P 20</u>	<u>After P 20</u>
<u>òbìsà</u> 'he asks'	Ak <u>òbìsá</u> As <u>òbìsâ</u>
<u>òtiè</u> 'he listens'	Ak <u>òtié</u> As <u>òtiê</u>

(The tone patterns of the forms in the right-hand column may be compared with the surface tone patterns of the corresponding Fante forms--òbìsà, òtsiè--to which P 20 has not applied.) (In Asante, the final falling tone that results from application of P 20 is later changed to high by P 87. The fact that P 20 results in a low-falling tone sequence in Asante but a low-high tone sequence in Akuapem is, however, sometimes attested by the surface tone pattern of the word that follows the verb. Compare the surface tone patterns of Ak òbìsá àkòá/As òbìsâ àkòá 'He asks a man.'. The Akuapem derivation is òbìsâ àkòá → òbìsá àkòá (by P 20) → òbìsá àkòá (by a P-rule that raises the tone of a noun prefix after a high tone). The Asante derivation is òbìsâ àkòá → òbìsâ àkòá (by P 20) → òbìsá àkòá (by P 87). The P-rule that raises the tone of a noun

prefix after a high tone follows P 20 but precedes P 87, and therefore does not apply in the cited Asante derivation.)

(c) PRO. All of the dialect-specific tonal rules that apply to affirmative forms that include HAB (cf. subsection (b), above) also apply to affirmative forms that include the PROgressive-aspect prefix /dì/, except that the Akuapem-Asante rule, P 19 (the rule that changes a low tone on a monosyllabic VR to high), does not apply in Asante to an affirmative verb that includes PRO. Thus, for example, the low-tone VR fà 'take' retains its low tone in As òrèfà [òòfà?] 'he is taking'. (For a discussion of P-rules that affect the segmental form of the PRO prefix, cf. Section 4.32.) In Akuapem, on the other hand, òrèfà → òrèfá through application of P 19, and then P 50, the Akuapem-Fante rule that reverses the tones on a low-tone aspectual prefix followed by a high-tone monosyllabic VR, changes òrèfá to the Ak surface form òréfà. Other examples of the operation of rules P 19 and P 50 on Vs that include PRO are:

<u>Before P 19</u>	<u>After P 19</u>	<u>After P 50</u>
<u>òrèkò</u> 'he is fighting'	Ak <u>òrèkó</u>	Ak <u>òrékò</u>
<u>òrèbá</u> 'he is coming'		Ak-Fa <u>òrébà</u>

Examples of the operation of P 16 (the Asante rule that adds a low tone at the end of a high-tone monosyllabic VR that is preceded by an aspectual prefix with low tone) and P 20 (the Akuapem-Asante rule that changes the tones of disyllabic VRs with an underlying high-low tone pattern) in affirmative-progressive verbs are: òrèbá 'he is coming' → As òrèbâ [òòbâ] (by P 16) and òrèkásà 'he is speaking' → Ak òrèkàsá/As òrèkàsâ [òòkàsâ] (by P 20).

(d) PAS. Affirmative formations involving the PAST-aspect suffix /ì/ (cf. Section 4.33 for discussion of the suffix itself), undergo some of the same dialect-specific tonal rules as do HAB and PRO formations (cf. subsections (b) and (c), above). Thus òfà + PAS 'he took' → Ak-As òfá + PAS (by P 19), òkásà + PAS 'he spoke' → Ak òkàsá + PAS/As òkàsâ + PAS (by P 20). (The effect of P 19 upon affirmative-past forms in Asante is later nullified by the operation of P 45--see below.)

In Asante and Fante, there are further rules that apply to affirmative-past forms. In Asante, P 45 changes the tone of monosyllabic VRs in affirmative-past forms to low in all cases. Compare the tones of:

Akuapem

òtòò òhómá. 'He bought a book.'
òtòè. 'He bought it.'

Asante

òtòò òhómá.
òtòòè(yè).

In Fante, P 46 places high tone on any monosyllabic VR that precedes the PAS suffix, and reverses the tone pattern of any disyllabic VR that precedes the suffix, changing a low-high pattern to high-low and vice versa. Thus òdà + PAS 'he slept' → Fa òdà + PAS [òdàà], òkyèré + PAS 'he showed' → Fa òkyèré + PAS [òtçíré], and òkàsà + PAS 'he spoke' → òkàsà + PAS [òkàsàà]. (P 46 also applies to negative forms in Fante that involve the PAS suffix--cf. Section 4.92, subsection (c).)

(e) PER. In affirmative formations that involve the PERFect-aspect prefix /à/ (cf. Section 4.33), P 19, P 50, P 16, and P 20 apply as they do in various other formations already discussed. P 19 changes, e.g., [wààfà?] 'he has taken' to Ak-As [wààfá?]; P 50 changes, e.g., [wààbá] 'he has come' to Ak-Fa [wààbà]; P 16 changes [wààbá] to As [wààbá]; and P 20 changes, e.g., [wààkàsà] 'he has spoken' to Ak [wààkàsá]/As [wààkàsá].

In addition, there are certain tonal rules that are specifically triggered by the occurrence of PER in an affirmative formation. The first of these, P 48, places a high-tone on the first (or only) syllable that immediately follows PER. In Akuapem and Asante, this rule operates vacuously in the case of monosyllabic VRs (which are already high by virtue of the operation of P 19). In Fante, however, it is P 48 that changes a low-tone monosyllabic VR to high immediately after PER.

In all dialects, after P 48 has applied, any monosyllabic VR that immediately follows PER has high tone, either because the underlying tone of the VR is high or because the underlying low tone of the VR has been replaced by high (by means of P 19 in the case of Akuapem and Asante, or by

means of P 48 in the case of Fante). It will be recalled that Akuapem and Fante have a rule, P 50, which reverses the tones on a low-tone aspectual prefix followed by a high-tone monosyllabic VR. Since PER has low tone, and since all monosyllabic VRs that follow it have high tone in both Akuapem and Fante, P 50 always applies to such formations in these dialects. Thus the rule applies in both dialects to affirmative PER forms whose VRs have underlying low tone--note the surface tone pattern of Ak-Fa [wàáàfà?] 'he has taken' (cf. /fàt/ 'take')--as well as to those whose VRs have underlying high tone.

In addition to raising the tone of low-tone monosyllabic VRs in Fante, P 48 raises the tone of the first syllable of all disyllabic VRs in Akuapem and Asante (since in these dialects, after the application of P 20, all disyllabic VRs have initial low tone), and of disyllabic VRs with underlying initial low tone in Fante. Examples of the operation of P 48 on disyllabic VRs are:

<u>Before P 48</u>		<u>After P 48</u>
$\left\{ \begin{array}{l} \text{Ak [wààkàsá]} \\ \text{As [wààkàsâ]} \end{array} \right\}$	'he has spoken'	$\left\{ \begin{array}{l} \text{Ak [wààkásá]} \\ \text{As [wààkásâ]} \end{array} \right\}$
[wààtçìrê]	'he has shown'	[wààtçírê]

No further tone rules apply to forms like [wààtçírê] in Akuapem and Asante, but in Fante there is a rule, P 51, which changes a low tone on PER to high immediately before a high tone, producing the Fante surface tone pattern [wàátçírê]. This rule is also responsible for the high tone on PER in a surface form such as Fa [wàákásà].

In Akuapem and Asante when the tone of the syllable immediately preceding PER is high (in affirmative formations), a high tone is added, by means of P 57, at the beginning of PER itself. For example, through the operation of P 57, Ak [wáàkásá]/As [wáàkásâ] 'you (sg.) have spoken' → Ak [wáâkásá]/As [wáâkásâ], and As [wáàbâ] 'you (sg.) have come' → [wáâbâ]. (By later rules Ak [wáâkásá]/As [wáâkásâ] → [wáákásá] and As [wáâbâ] → [wáábâ], the results being the occurring surface tone patterns.)

(f) FUT. There are only two tone rules that apply to VRs that immediately follow the FUTure-aspect prefix /bé/ (cf. Section 4.34), and neither of these rules is limited to formations that include FUT. One of the rules is the general Asante-Akuapem rule, P 19, which changes the tone of low-tone monosyllabic VRs to high (and which is not, of course, dependent upon the occurrence of FUT). This rule accounts for the tonal difference between, e.g., Ak-As [òbéfi?] and Fa [òbéfi?] 'he will leave'. The second rule, P 79, changes certain high-low-high sequences to high-rising-high (ultimately realized as high-drop-high--cf. Section 3.93). Among the sequences to which P 79 applies are a sequence consisting of the FUT prefix followed by a VR with a low-high tone pattern. By means of P 79, [òbétçiré] 'he will show' → [òbétçiré] (ultimately, [òbétçiré], etc.

It may be noted that the Akuapem-Asante rule changing a high-low tone pattern on a VR to low-high, P 20, does not apply to VRs with medial /t/ or /s/ that immediately follows a high tone. Thus Akuapem and Asante show the same tone pattern as does Fante for verbs like [òbéfit] 'he will fan' and [òbékàsà] 'he will speak'.

(g) OPT. Monosyllabic VRs that follow the OPTative-aspect prefix /N/ (cf. Section 4.35) have high surface tone in all dialects, regardless of whether their underlying tone is high or low: e.g., [ònkó?] 'he should go' (cf. the underlying form of the VR, /kót/ 'go'), [ómfi?] 'he should leave' (cf. the underlying form of the VR, /fit/ 'leave'). (INGressive prefixes that follow OPT also show high tone in all dialects--cf. Section 4.93.) Disyllabic VRs that follow OPT have a high-high tone pattern in Akuapem and Asante, a high-low tone pattern in Fante--once more, regardless of the tone pattern of the underlying form of the VR: e.g., Ak-As [ònkàsà]/Fa [ònkàsà] 'he should speak' (cf. the underlying VR, /kàsà/ 'speak'), Ak-As [òntçiré]/Fa [òntçiré] 'he should show' (cf. the underlying VR, /kidé/ 'show'). While it would be possible to give some other account of the surface tones that occur on VRs in forms that involve OPT, the simplest analysis seems to be to posit a single P-rule, P 49, which directly produces the occurring surface tones.

(h) IMP. As is explained in Section 4.35, the IMPerative-aspect prefix (which has a zero segmental form) is a transformational replacement of OPT in the environment of an underlying second-person-singular SC. (The second-person-singular SC is itself deleted by means of the same transformation that replaces OPT with IMP.) Like OPT, IMP is replaced by HAB in negative forms, so that verbs with negative-imperative meanings are (except for the fact that they lack an SC) formally identical with negative-habitual verbs.

Imperative forms show no dialect variation in tone. Following IMP, all monosyllabic VRs have high tone before a pause, low tone elsewhere, while all disyllabic VRs show a low-low tone pattern both before a pause and elsewhere. These tonal characteristics of verbs that include IMP result from the operation of P 61 and P 66. (P 61 assigns low tone to IMP formations. P 66 changes the low tone of a sentence-final or clause-final monosyllabic VR that follows IMP to high. Some examples of the surface tone patterns of IMP forms are:

<u>Kó.</u>	'Go.'
<u>Kò Kùmasé.</u>	'Go to Kumase.'
<u>Dá.</u>	'Sleep.'
<u>Dà há.</u>	'Sleep here.'
<u>Bisà (Kòfí).</u>	'Ask (Kofi).'
<u>Kyèrè (Kòfí).</u>	'Show (Kofi).'

(i) CON. The underlying forms of affirmative-consecutive verbs are identical with those of affirmative-perfect verbs, since the CON prefix /à/ (cf. Section 4.36) is homophonous with the PER prefix. The surface tone patterns of affirmative consecutive and perfect verbs, however, are frequently distinct, since there are certain tone-changing P-rules that apply to the formations that include CON but not to those that include PER, and certain other tone-changing P-rules of which the reverse is true.

The presence of CON in affirmative verbs with monosyllabic VRs triggers two tone-changing P-rules, P 43 and P 66, that do not apply to verbs that include PER. P 43 places low tone on any monosyllabic VR that immediately follows CON. P 66 reverses the effect of P 43 in those

cases where the verb is sentence-final or clause-final, changing a low tone on a monosyllabic VR that follows CON to high tone in these contexts. (P 66 also applies to imperatives--cf. subsection (h), above.) Thus we find low tone on the VR in, e.g., [(nǎ) wààbà há] '(and) he will come here', which reflects the operation of P 43, but to which P 66 has not applied (since the VR *ba* /*bá*/ 'come' is not in sentence- or clause-final position), and high tone on the VR in, e.g., [(nǎ) wààbá] '(and) he will come', which reflects the operation of both P 43 and P 66. (It may be noted that we postulate the application of P 43 in all cases and the reversal of its effect by P 66 in sentence- or clause-final position, rather than adopting the apparently simpler alternative of restricting the application of P 43 to cases in which the VR is non-final. The reason for this decision is that if a form such as sentence-final *waaba* had always had a high tone on the VR, one would expect the Ak-Fa rule, P 50 (which changes a low-high tone pattern on an aspectual prefix followed by monosyllabic VR to high-low), to have applied. That is, one would expect [wààbá] to have become Ak-Fa [wàábà], which is, in fact, the tone pattern found in the perfect in these dialects. If, however, the consecutive form is [wààbà] at the point in the rules at which P 50 applies, the conditions for the application of this rule are not met, and its failure to apply is explained.)

In Akuapem and Asante, when the tone of the syllable immediately preceding CON is high (in affirmative formations), P 57 (which also applies to forms that include PER) adds a high tone at the beginning of the aspectual prefix. This results in a falling tone on the prefix, which, by later rules, becomes a high tone. Thus Ak-As [(nǎ) wààbà há] '(and) you will come ~~here~~' is changed by P 57 to [(nǎ) wáábà há] (ultimately, [(nǎ) wáábà há]) and Ak-As [(nǎ) wààbá] '(and) you will come' is changed by P 57 to [(nǎ) wáábá] (ultimately, [(nǎ) wáábá]).

Apart from P 57, the only tone-changing rule that affirmative formations with CON and PER have in common is P 20, the Akuapem-Asante rule that changes a high-low tone pattern on a disyllabic VR to Ak low-high/As low-falling. (This rule is responsible for differences such as that between Ak [(nǎ) wààkàsá]/As [(nǎ) wààkàsâ] and Fa [(nǎ) wààkàsà] '(and) he will speak'.) The other tone-changing

P-rules discussed in subsection (c), above, apply to formations that include PER but not to those that include CON. For example, P 48, which changes a low tone on the first syllable of a VR to high after PER, does not apply to change a low tone on the first syllable of a VR to high after CON: compare Ak [wààkásá] 'he has spoken' and Ak [(nǎ) wààkásá] '(and) he will speak'. Similarly, P 51, which is responsible for the high tone on the PER prefix in Fa [wàátçíré] 'he has shown', does not apply to the CON prefix in Fa [(nǎ) wàátçíré] '(and) he will show'.

4.92 Tone Changes in Negative Simple Vs.

As is noted in Section 4.41, only six different aspectual morphemes occur in verbs that include the NEGative prefix /N/. These are the STative, HABitual, PROgressive, PAST, PERFect, and CONsecutive morphemes. (The negative-habitual form is used to express negative-optative and negative-imperative meanings as well as negative-habitual meanings. The negative-progressive form is used to express negative-future as well as negative-progressive meanings. In negative forms, the PAS suffix /i/ occurs in verbs with negative-perfect meanings while the PER prefix /à/ occurs in verbs with negative-past meanings.) Of the six aspect-marked forms of negative simple verbs, there are three--the forms involving the HAB, PER, and CON morphemes--to which no tone-changing P-rules specific to negative verbs normally apply. That is, the only tone-changing P-rules that normally apply to these verbs are two rather widely applicable Akuapem-Asante rules that also affect various non-negative verb forms. (However, see Section 4.95 for an account of Asante tone-lowering in negative verbs followed by pronouns.) These two Akuapem-Asante rules are: P 19, the rule that replaces low tone on a monosyllabic VR by high after a low-tone prefix; and P 20, the rule that replaces a high-low tone pattern on a disyllabic VR by low-high in Akuapem, low-falling in Asante when the syllable before the VR does not have high tone. Examples of the application of these rules to negative simple verbs involving the HAB and PER morphemes are:

<u>Before P 19</u>	<u>After P 19</u>	<u>After P 20</u>
<u>òmfà</u> 'he doesn't take'	Ak-As <u>òmfá</u>	
<u>ònkàsà</u> 'he doesn't speak'		{ Ak <u>ònkàsá</u> As <u>ònkàsâ</u> }
<u>wàmfà</u> 'he didn't take'	Ak-As <u>wàmfá</u>	
<u>wànkàsà</u> 'he didn't speak'		{ Ak <u>wànkàsá</u> As <u>wànkàsâ</u> }

(Since the rules in question do not apply in Fante, Fante has the forms listed in the leftmost column as surface forms. Forms involving the CON affix are not listed separately above, but would be homophonous with the listed forms involving the PER affix.)

In the case of negative simple verbs involving the remaining three aspectual morphemes--(a) STA, (b) PRO, (c) PAS--certain specific tone-changing P-rules do apply. These rules are discussed below.

(a) STA. As is noted in Section 4.91, subsection (a), there is a rule, P 43, that makes the tone(s) on the vowel(s) of a VR that follows STA low. This rule applies to negative, as to affirmative, stative verbs. In the case of negative-stative verbs, however, P 44, which follows P 43, changes the low tone in the syllable immediately after NEG to high. In Fante, P 44 also changes the tone of NEG itself to high. The operation of the rule may be illustrated as follows:

<u>Before P 44</u>	<u>After P 44</u>
<u>òmfì</u> 'he isn't from'	Ak-As <u>òmfí</u> /Fa <u>òmfí</u>
<u>ònhye</u> 'he isn't wearing'	Ak-As <u>ònhyé</u> /Fa <u>ònhyé</u>
<u>ònkùrà</u> 'he isn't holding'	Ak-As <u>ònkùrà</u> /Fa <u>ònkùrà</u>
<u>òmfàtà</u> 'he doesn't deserve'	Ak-As <u>òmfátà</u> /Fa <u>òmfátà</u>

In Akuapem, no further rules apply to negative-stative verbs. In Asante, a further rule, P 57, applies in those cases where the syllable immediately before NEG has high tone--e.g., where it is the SC (subject-concord prefix) wó- 'you (sg.)'. In such cases, a high tone is added at the beginning of NEG, so that NEG acquires a falling tone. For example:

Before P 57

wònhyé 'you aren't wearing'
wómfàtá 'you don't deserve'

After P 57

As wónhyé
 As wómfàtá

(By the operation of subsequent P-rules, the sequence of a falling tone plus a high tone is realized as a surface sequence consisting of a high tone plus a mid tone. Thus we find negative-stative surface forms such as As wónhyé, wómfàtá--cf. Ak wònhyé, wómfàtá.) (P 57 also applies in the case of affirmative-perfect and affirmative-consecutive verbs where PER and CON are preceded by a high-tone syllable--cf. Section 4.91, subsections (e) and (i).)

In Fante, a further rule, P 55, applies to all negative-stative verbs that have an overt subject-concord prefix. This rule replaces a low tone on SC by high before a high tone on NEG, changing, e.g., ònhyé to ónhyé. Some further examples are:

Before P 55

ònfí 'he isn't from'
ònkùrà 'he isn't holding'

After P 55

Fa ónfí
 Fa ónkùrà

(b) PRO. Two of the tone-changing P-rules that apply to affirmative simple verbs that include PRO (cf. Section 4.91, subsection (c)) also apply to negative simple verbs that include this morpheme. These are the Akuapem-Asante rules P 19 and P 20. (In the case of P 19, which changes a low tone on a monosyllabic VR to high, the rule fails to apply to affirmative-progressive verbs in Asante, but applies to negative verbs in both Asante and Akuapem.) Examples of the application of these rules to negative simple verbs that include PRO are:

<u>Before P 19</u>	<u>After P 19</u>	<u>After P 20</u>
<u>òrènfà</u> 'he isn't taking, he won't take'	Ak-As <u>òrènfá</u>	
<u>òrènkàsà</u> 'he isn't speaking, he won't speak'		{ Ak <u>òrènkàsá</u> As <u>òrènkàsá</u> }

In addition to these rules, all dialects have two further rules that apply to negative verbs that include PRO, but not to their affirmative counterparts. These are: P 53, which replaces the low tone on PRO by high before NEG, and P 55, which replaces a low tone on SC by high before a high-tone PRO. (In Fante, P 55 is also responsible for high tones on SCs in negative-stative verbs--cf. subsection (a), above.) Examples of the operation of these rules are:

<u>Before P 53</u>	<u>After P 53</u>	<u>After P 55</u>
{ Ak-As <u>òrènfà</u> Fa <u>òrènfà</u> }	{ Ak-As <u>òrénfá</u> Fa <u>òrènfà</u> }	{ Ak-As <u>órénfá</u> Fa <u>òrènfà</u> }
{ Ak <u>òrènkàsà</u> As <u>òrènkàsà</u> Fa <u>òrènkàsà</u> }	{ Ak <u>òrénkàsá</u> As <u>òrénkàsà</u> Fa <u>òrènkàsà</u> }	{ Ak <u>órénkàsá</u> As <u>órénkàsà</u> Fa <u>òrènkàsà</u> }
<u>òrènkýé</u> 'he isn't dividing, he won't divide'	<u>òrénkýé</u>	<u>órénkýé</u>
<u>òrènkýèré</u> 'he isn't showing, he won't show'	<u>òrénkýèré</u>	<u>órénkýèré</u>

(In Asante, step (1) of P 56 obligatorily applies to delete the segmental features of PRO--cf. Section 4.52. Thus órénfá [órímfá?] → As [ómfá?], órénkàsá [órínkàsá?] → As [ónkàsá?], etc. In Akuapem and Fante, application of

P 56 is optional, and thus these dialects show freely varying surface forms such as Ak [órímfá?] ~ [ómfá?] and Fa [órímfà?] ~ [ómfà?].)

(c) PAS. Negative formations involving the PAS suffix (i.e., formations with negative-perfect meanings) undergo most of the same dialect-specific tonal rules as do affirmative formations involving the suffix. Specifically, in Akuapem and Asante the negative formations undergo P 19 if they have a low-tone monosyllabic VR and P 20 if they have a disyllabic VR with a high-low tone pattern, while in Fante the negative formations all undergo P 46. Thus P 19 changes ò + NEG + dà + PAS 'he slept' to Ak-As ò + NEG + dá + PAS, P 20 changes ò + NEG + kàsà + PAS to Ak ò + NEG + kàsá + PAS/As ò + NEG + kàsà + PAS, and P 46 changes ò + NEG + dà + PAS, ò + NEG + kàsà + PAS, and ò + NEG + kyèrè + PAS 'he showed' to, respectively, Fa ò + NEG + dá + PAS, Fa ò + NEG + kàsá + PAS, and Fa ò + NEG + kyèrè + PAS. (The Asante rule, P 45, that changes the tone of a monosyllabic VR to low in affirmative formations involving PAS does not apply to negative formations.)

After the above rules have applied to negative formations that involve the PAS suffix, certain further dialect-specific tonal rules may apply. Akuapem has no further tonal rules that apply when the VR is monosyllabic, but has two rules that apply when it is disyllabic: P 57, which adds a high tone at the beginning of NEG when the preceding syllable has high tone, and P 58, which changes a low tone on the first syllable of the VR to high after a low-tone NEG. Examples of the effect of these rules are:

<u>Before P 57</u>	<u>After P 57</u>	<u>After P 58</u>
Ak <u>wónkàsáè</u> 'you haven't spoken'	<u>wónkàsáè</u>	
Ak <u>ònkàsáè</u> 'he hasn't spoken'		<u>ònkàsáè</u>

(Note that, as a result of the application of P 57, wónkàsáè does not meet the conditions required for the application of P 58. The falling tone on the NEG prefix in wónkàsáè is later replaced by a high tone by P 87, resulting in the surface tone pattern wónkàsáè.)

Asante has these same two P-rules applying to negative-perfect Vs with disyllabic VRs, but the rules apply in the opposite order in this dialect. Thus Asante shows derivations like the following:

<u>Before P 58</u>	<u>After P 58</u>	<u>After P 57</u>
As <u>wónkàsáàè</u> 'you haven't spoken'	<u>wónkásáàè</u>	<u>wónkásáàè</u>
As <u>ònkàsáàè</u> 'he hasn't spoken'	<u>ònkásáàè</u>	

(Through the operation of later P-rules, wónkásáàè is changed to wónkásáàè and ònkàsáàè is changed to ònkásáàè.) (For a discussion of dialect differences in the segmental forms of verbs involving the PAS suffix, cf. Section 4.33, subsections (a) and (b).)

Unlike Akuapem, Asante has a tone-changing rule that applies specifically to certain negative formations that include monosyllabic VRs and the PAS suffix. This is P 62, which applies to such formations whenever a high tone precedes NEG. The effect of the rule is to change the tone of NEG to high and that of the VR to low. Compare the tones of:

<u>Akuapem</u>		<u>Asante</u>
<u>Wóntòò òhómá.</u>	'You haven't bought a book.'	<u>Wóntòò òhómá.</u>
<u>Wóntòè.</u>	'You haven't bought it.'	<u>Wóntòòè(yè).</u>

In Fante, in addition to P 46 (see above), two further rules apply to negative formations that include the PAS suffix: P 54 and P 55. P 54 places high tone on NEG and on the syllable that immediately follows NEG. (Since the syllable that immediately follows NEG is frequently already high, either inherently or as a result of the prior operation of P 46, this part of P 54 often applies vacuously.) P 55 (which is not limited in its operation to verbs involving the PAS suffix) places high tone on an SC prefix that precedes a high-tone NEG. Examples of the operation of these rules are:

<u>Before P 54</u>	<u>After P 54</u>	<u>After P 55</u>
Fa <u>òndáà</u> 'he hasn't slept'	<u>òndáà</u>	<u>òndáà</u>
Fa <u>ònkásáà</u> 'he hasn't spoken'	<u>ònkásáà</u>	<u>ònkásáà</u>
Fa <u>ònkyéré</u> 'he hasn't shown'	<u>ònkyéré</u>	<u>ònkyéré</u>

4.93 Tone Changes in Ingressive Vs.

Verbs that include one of the two Akan INgressive prefixes, /bé/ and /kó/, may undergo, in addition to the vowel-harmony P-rules discussed in Section 4.50, certain special tone-changing P-rules. As was mentioned in Section 4.50, Akuapem and Asante have a rule, P 47, that changes the tone of ING prefixes from high to low. This rule accounts for tonal differences such as that between Ak-As òbèyé and Fa òbèyé 'he comes to do'. The ordering of P 47 in relation to other P-rules that affect tone is significant. For example, P 47 follows P 20, the Akuapem-Asante rule that changes a high-low tone pattern on a disyllabic VR to low-high except immediately after a high tone. For this reason, P 20 fails to apply to forms that include ING, and the high-low tone pattern on the VR is retained in forms such as Ak-As òbèbísà nò 'he comes to ask him' and Ak-As òkòbísà nò 'he goes to ask him'. (Cf. Ak-As òbísà nò 'he asks him'. This form, which lacks the ING prefix, reflects the operation of P 20.) On the other hand, P 47 precedes certain P-rules which assign high tone to syllables that follow specific aspectual prefixes: e.g., P 48 and P 49, which apply respectively to PERFect-affirmative and OPTative-affirmative forms. Thus we find high tone on the ING prefixes of, e.g., Ak-As wàbèyé 'he has come to do (it)' and Ak-As ònkóyé 'he should go to do (it)'.

There are several other tone-changing P-rules that affect certain forms that include ING but do not affect otherwise identical forms that lack ING. One of these is P 79, a rule that changes certain high-low-high sequences to high-rising-high (ultimately realized as high-mid-high).

Among the sequences to which P 79 applies is a sequence consisting of a high-tone ING plus a VR with a low-high tone pattern. Through the application of P 79, e.g., Fa òbékýèré 'he comes to show' → òbékýěré (ultimately, òbékýéré--cf. Fa òkýéré 'he shows'). Since P 79 follows P 47, the Akuapem-Asante rule mentioned above that changes the tone of ING to low, Akuapem and Asante ingressive forms that include low-high VRs do not usually include an appropriate high-low sequence at the point in the rules at which P 79 applies, and the rule is thus usually inapplicable in these dialects. Thus the Akuapem-Asante counterpart of Fa òbékýèré is òbèkýèré. In those cases mentioned above, however, where the effect of P 47 has been reversed by a rule that assigns high tone to ING after certain aspectual affixes, P 79 may apply in Akuapem and Asante as well as in Fante. Thus in a perfect-affirmative-ingressive formed with a low-high VR, the Akuapem-Asante surface form reflects the operation of P 79: e.g., Ak-As wàbékýèré [wààbétçiré] 'he has come to show'. (The original tone pattern of this form is wàbékýèré [wààbétçiré]. In Akuapem and Asante, this is first changed to [wààbétçiré] by P 47, then restored to [wààbétçiré] by P 48. In Fante, P 47 does not apply but the Fante rule placing high tone on the PER prefix, P 51, applies, changing [wààbétçiré] to [wàábétçiré]. The effect of P 79 is to change Ak-As [wààbétçiré] to [wààbétçiré] (ultimately [wààbétçiré]) and Fa [wààbétçiré] to [wàábétçiré] (ultimately [wàábétçiré]).

In Akuapem and Asante, there is another tone-changing P-rule, P 67, which applies to certain ING formations that include disyllabic VRs. In this case, the rule applies to VRs that have a high-low tone pattern. When a sequence consisting of an ING prefix plus such a VR occurs immediately before a pause, P 67 operates to add a high tone at the end of the VR: i.e., to change the final low tone to a rising tone. The rule applies, for example, to change a sentence-final or clause-final occurrence of Ak-As òbèbisà 'he comes to,ask' to òbèbisá (which is ultimately realized as òbèbisá). P 67 applies only to forms that precede pause. Thus it does not apply when the verb is followed by an object: cf. the surface tone pattern of Ak-As òbèbisà nò 'he comes to ask him'. Since P 67 is an

Akuapem-Asante rule, it has no effect upon Fante forms. For example, the Fante counterpart of Ak-As òbèbísà is òbèbísà.

It should be noted that P 61 and P 66, the rules that account for the special tone patterns of imperative verbs (cf. Section 4.91, subsection (h)) never apply when ING is present as well as IMP. We thus find contrasts such as the following between the surface tone patterns of imperatives that do and do not include ING:

<u>IMP + ING</u>		<u>IMP</u>	
{ Ak-As <u>bèdá</u> }	{ Fa <u>bédà</u> }	'come sleep'	<u>dá</u> 'sleep'
{ Ak-As <u>bèdá há</u> }	{ Fa <u>bédà há</u> }	'come sleep here'	<u>dà há</u> 'sleep here'
{ Ak-As <u>bèbísà</u> }	{ Fa <u>bébísà</u> }	'come ask'	<u>bisà</u> 'ask'
{ Ak-As <u>bèbísà Kòfí</u> }	{ Fa <u>bébísà Kòfí</u> }	'come ask Kofi'	<u>bisà Kòfí</u> 'ask Kofi'

4.94 Tone Changes in Reduplicated Vs.

This section discusses certain tone-changing P-rules that apply to forms that result from application of the general rule of disyllabic reduplication. As is explained in Section 4.63, the disyllabic-RED rule, P 23, operates to replace a RED symbol by a copy of the two syllables that immediately follow RED. (When there are two or more occurrences of RED before a disyllabic VR, or before a reduplicating syllable plus a monosyllabic VR, P 23 re-applies until all REDs have been specified. In certain cases, further rules may alter the segmental structure of forms that result from application of the disyllabic-RED rule--cf. Section 4.64.) After the disyllabic-RED rule has been applied, a tone-changing rule, P 59, operates to replace any high tones on VRs or REDs that follow the first (or

only) occurrence of disyllabic RED by low tones. Some examples of the operation of P 59 are:

<u>Before P 59</u>	<u>After P 59</u>
<u>òkyèrékyèré</u> 'he shows and shows'	<u>òkyèrékyèrè</u>
<u>òkyèrékyèrékyèré</u> 'he shows and shows and shows'	<u>òkyèrékyèrèkyèrè</u>
<u>òhwèhwèhwèhwé</u> 'he looks and looks for'	<u>òhwèhwèhwèhwè</u>
Ak <u>òkàsákàsá</u>	Ak <u>òkàsákàsà</u>
As <u>òkàsákàsá</u>	As <u>òkàsákàsà</u>
Fa <u>òkàsákàsà</u> 'he speaks and speaks'	Fa <u>òkàsákàsà</u>

(It will be observed from the last set of examples that the disyllabic-RED rule follows P 20, the Ak-As rule that changes kàsà to Ak kàsá/As kàsá, etc. Asante òkàsákàsà is later changed to òkàsákàsà by P 87, and may be further changed by P 65, discussed below.)

In Fante, in addition to lowering tones that follow the first occurrence of disyllabic RED, P 59 lowers the tone of a nasal consonant at the end of the first disyllabic RED itself. Thus the rule operates to change Fa òtòntòntòntón 'he sells and sells and sells' to Fa òtòntòntòntòn. In Akuapem and Asante, the tone of a nasal consonant at the end of the first disyllabic RED is not lowered by P 59. Thus P 59 changes Ak-As òtòntòntòntón (the Ak-As equivalent of Fa òtòntòntòntón) to Ak-As òtòntòntòntòn.

In Akuapem and Fante, after P 59 has applied, no further tone rules are triggered by the occurrence of disyllabic RED. In Asante, however, there is a further rule, P 65, that applies in certain specifiable cases: viz., whenever an affirmative verb formation that includes disyllabic RED occurs sentence-finally or clause-finally.

The rule operates upon the products of P 59, which, in Asante, always show a low-high tone pattern on the first (or only) occurrence of disyllabic RED, and low tone on any following occurrences of RED and on VR. P 65 affects all syllables that follow the first (or only) occurrence of RED. It adds a high tone immediately after the low tone of the first such syllable, so that this syllable shows a rising tone, and replaces the low tone of all subsequent syllables affected by the rule to high. Examples of the operation of the rule are:

Before P 65

As òkyèrékyèrè
 As òkyèrékyèrèkyèrè
 As òhwèhwéhwèhwè
 As òkàsákàsà

After P 65

òkyèrékyěré
òkyèrékyěrékyéré
òhwèhwéhwéhwé
òkàsákásá

After P 65 has applied, subsequent P-rules have the effect of replacing the rising tone on the syllable following RED by a mid tone. Thus we have surface tone patterns such as:

As òkàsákásá. 'He speaks and speaks.'
 As òkàsákásákásá. 'He speaks and speaks and speaks.'

Since P 65 applies only to sentence-final or clause-final verbs, Asante shows tonal contrasts such as the following:

As òhwèhwéhwéhwé. 'He looks and looks (for it).'
 As òhwèhwéhwèhwè Kòfí. 'He looks and looks for Kofi.'

Akuapem and Fante do not show tonal contrasts of this kind:

Ak-Fa òhwèhwéhwèhwè (Kòfí). 'He looks and looks for Kofi.'

P 65 does not apply to negative verbs. Thus:

As ònhwèhwéhwèhwè. 'He doesn't look and look (for it).'

4.95 Tone Changes in Verb-Plus-Pronoun Constructions.

This section is concerned with two Asante P-rules: P 17, which changes low tones on pronouns to high after certain Vs; and P 18, which changes high tone on certain Vs to low before pronouns.

The pronouns whose tone is changed to high by P 17 may be either object pronouns or possessive pronouns. (Prior to the operation of P 17, all object pronouns have low tone in Asante. Asante possessive pronouns, on the other hand, have low tone only in certain cases, the occurring tone depending upon the noun that follows the pronoun. The possessive pronoun has low tone if the root of the following noun has two or more syllables or is a monosyllable belonging to a relatively small set of "inalienables"; it has high tone if the root of the following noun is a monosyllable not belonging to the above-mentioned set of inalienables: thus, As nè sɔ̀dɛ́ɛ 'his pomade', As nè bá 'his child' but As né ká 'his debt', né dán 'his room'.) P 17 operates to replace a low tone on an object or possessive pronoun by a high tone when the following conditions are met: (a) the pronoun immediately follows a verb with a final high tone; (b) if the pronoun is an object pronoun, it is immediately followed by a pause.

Examples of the operation of P 17 are:

Before P 17	After P 17
As <u>òkyèrɛ́</u> { <u>nò.</u> <u>nè bá.</u> } 'He shows { him.' his son.' }	<u>òkyèrɛ́</u> { <u>nó.</u> <u>né bá.</u> }
As <u>òbéhú</u> { <u>nò.</u> <u>nè bá.</u> } 'He will see { him.' his son.' }	<u>òbéhú</u> { <u>nó.</u> <u>né bá.</u> }
As <u>ónhú</u> { <u>nò.</u> <u>nè bá.</u> } 'He should see { him.' his son.' }	<u>ónhú</u> { <u>nó.</u> <u>né bá.</u> }
As <u>ònghú</u> { <u>nò.</u> <u>nè bá.</u> } 'He doesn't see { him.' his son.' }	<u>ònghú</u> { <u>nó.</u> <u>né bá.</u> }
As <u>òkóhú</u> { <u>nò.</u> <u>nè bá.</u> } 'He goes to see { him.' his son.' }	<u>òkóhú</u> { <u>nó.</u> <u>né bá.</u> }

(In the case of the first three examples above, the tone pattern shown in the right-hand column is the surface tone pattern. In the case of the last two examples, subsequent rules change the tone patterns on the Vs: As Ònhù nó/né bá → Ònhù nó/né bá by P 18--see discussion below--while As Òkóhù nó/né bá → Òkòhù nó/né bá by P 47--cf. Section 4.93.)

It should be noted that pronoun tones are raised only after those disyllabic VRs that end in a high tone at the point in the P-rules at which P 17 applies. Thus the raising does not occur after disyllabic VRs that acquire a low-high tone pattern as a result of the operation of P-rules, but whose underlying tone pattern is high-low. Compare, for example, the surface tone patterns of:

As Òkyèré nó. 'He shows him.'

and:

As Òbísá nò. 'He asks him.'

Unlike kyers, whose underlying tone pattern is low-high (/kidé/), bisa acquires its low-high surface tone pattern as a result of the operation of P 20 and P 87. The underlying high-low tone pattern (/bísà/) has not yet been changed at the point in the P-rules at which P 17 applies, and hence the conditions required for the application of the rule are not met.

Similarly, in order for P 17 to raise the tone of a pronoun that follows a monosyllabic VR (in the appropriate contexts), the VR must have high tone at the point in the P-rules at which P 17 applies. Thus P 17 does not apply, for example, to a pronoun that follows FUT plus a monosyllabic VR such as fa 'take' (underlying form /fàt/), since, at the point in the P-rules at which P 17 applies, fa still has low tone, and this low tone is replaced by high only later, through the application of P 19. Thus we find a contrast between the surface tone patterns of:

As Òbéhù nó. 'He will see him.'

and:

As Òbéfá nò. 'He will take him.'

(On the other hand, P 16, the Asante rule that adds a low tone at the end of a monosyllabic VR that immediately follows a low-tone aspectual prefix, precedes P 17. Thus As Wàhú nò 'He has seen him' → Wàhù nò by P 16, and no longer meets the requirements for pronoun-tone-raising.)

As was noted above, P 17 changes the tone of an object pronoun only when the pronoun is immediately followed by a pause: i.e., when it is in sentence-final or clause-final position. Thus the tone of the object pronoun remains low in:

As Òkyèré nò dáá. 'He always shows him.'
 As Òbéhú nò nné. 'He will see him today.'

The second rule to be discussed here, P 18, changes to low a high tone on a monosyllabic VR that is immediately preceded by NEG when the VR is immediately followed by a pronoun with high tone. In many cases, the high tone on the pronoun has been introduced as a result of P 17. Thus we have derivations such as the following:

<u>Before P 17</u>	<u>After P 17</u>	<u>After P 18</u>
As <u>Ònhú</u> { <u>nò</u> . <u>né</u> <u>bá</u> . }	<u>Ònhú</u> { <u>nó</u> . <u>né</u> <u>bá</u> . }	<u>Ònhù</u> { <u>nó</u> . <u>né</u> <u>bá</u> . }
'He doesn't see { him.' his son.' }		

The high tone on the pronoun may, however, have a different origin, as is true in the case of the pronouns of place, há 'here' and hó 'there', where the high tone is inherent. Pertinent examples of surface tone patterns are:

As Ònkò hó. 'He doesn't go there.'
 As Wàmmà há. 'He hasn't come here.'

In cases where the pronoun following the VR is low, P 18 does not apply. Note the surface tone pattern of:

As Ònhú nò dà. 'He never sees him.'

In the derivation of this sentence, P 17 has not applied to raise the tone of the object pronoun nò (because the

object pronoun is not immediately pre-pause--see above), and hence P 18 does not apply to lower the tone of the VR.

4.96 Tone Changes in Subordinative Vs.

The SUBordinative occurs at two points in surface structures: (1) as a constituent (in our formulation, the final constituent) of V; and (2) as the final constituent of VP. P-rules triggered by the SUB that occurs as the final constituent of VP are discussed in Section 4.81. As is noted in that section, VP-final SUB is listed in the lexicon as a high-tone mid vowel, but, as a result of the operation of P-rules, usually lacks a segmental realization in surface forms. (More specifically, VP-final SUB never has a segmental realization in surface forms in Akuapem and Fante, and in Asante has a segmental realization only in a limited number of cases.) The present section is concerned with the SUB that is a constituent of V, and with certain interactions between this SUB and VP-final SUB.

The SUB that is a constituent of V has no underlying systematic-phonemic form. Its presence in a V does, however, trigger the application of a tone-changing P-rule, P 60. P 60 has the effect of replacing certain low tones within the V by high tones or by falling tones. (The low tones that are affected by P 60 may themselves have been introduced by earlier P-rules.)

There is one difference between the operation of P 60 in, on the one hand, Akuapem and Fante and, on the other, Asante: in Akuapem and Fante the rule applies to replace a low tone on SC (the subject-concord prefix) by a high tone in all cases, while in Asante (at least in the sub-dialect we have studied most closely) a low tone on SC is replaced by a high tone only when the SC is immediately followed by PROgressive, PERfect, CONsecutive, or NEGative. For example, the low-tone on the SC (ɔ-) of a V like ɔ̀nkyèré 'he doesn't show', in which the SC is immediately followed by NEG, is replaced by a high tone in the presence of SUB in all dialects. Thus in Asante as well as in the other two dialects P 60 changes ɔ̀nkyèré to ɔ̃nkyèré. (For the change of the NEG n̄- to ñ-, see below.) However, the low tone on the SC of a V like ɔ̀kyèré 'he shows', in which the SC is not immediately followed by PRO, PER, CON or NEG,

is not affected by P 60 in Asante, but is affected by this rule in Akuapem and Fante. Thus P 60 changes òkyèré to As òkyéré/Ak-Fa ókyéré. (For the change of the VR kyèré to kyéré, see below.)

Except for the difference just discussed, P 60 may be stated as applying to the same types of constituents in all three dialects. In addition to its effect on a low-tone SC, P 60 operates, without any dialectal restrictions, to make the following changes in the presence of SUB: (1) a low tone is replaced by a high tone on: (a) any aspectual prefix; (b) an INGressive prefix; (c) a monosyllabic Verb Root that is immediately preceded by STative or NEGative or immediately followed by PAST; (d) the first syllable of a disyllabic VR that is not immediately preceded by NEG, FUT, or ING; (2) a high tone is added at the beginning of a low-tone NEG, the result being a falling tone on NEG. Some examples illustrating the above changes in Vs that include SUB are listed below.

<u>Before P 60</u>			<u>After P 60</u>		
(1.a)	As	<u>wàáyé</u>	'he has done'		<u>wááyé</u>
	As	<u>òrèyé</u> [òòjé]	'he is doing'		<u>óréyé</u> [óójé]
		<u>òrèkyèré</u>	'he is showing'		<u>órékyéré</u>
(1.b)	Ak-As	<u>òbèyé</u>	'he comes to do'	{ Ak	<u>óbéyé</u> }
				{ As	<u>òbèyé</u> }
	Ak-As	<u>òkòkàsà</u>	'he goes to speak'	{ Ak	<u>ókókàsà</u> }
				{ As	<u>òkókàsà</u> }
(1.c)		<u>òwò</u>	'he has'	{ Ak-Fa	<u>ówó</u> }
				{ As	<u>òwó</u> }
	Fa	<u>òndà</u>	'he doesn't sleep'		<u>óndá</u>
	As	<u>òyéè</u>	'he did'		<u>óyéè</u>
(1.d)		<u>òkyèré</u>	'he shows'	{ Ak-Fa	<u>ókyéré</u> }
				{ As	<u>òkyéré</u> }
	Ak-As	<u>òkàsá</u>	'he speaks'	{ Ak	<u>ókàsá</u> }
				{ As	<u>òkàsá</u> }

	<u>Before P 60</u>		<u>After P 60</u>
(2)	<u>ònyé</u>	'he doesn't do'	<u>ónyé</u>
	<u>ònkyèré</u>	'he doesn't show'	<u>ónkyèré</u>
	{ Ak-As <u>ònkòkàsà</u> Fa <u>ònkókàsà</u> }	'he doesn't go to speak'	<u>ónkókàsà</u>

(Through the operation of later P-rules, òndà, ónyé, ónkyèré and ónkókàsà are changed to, respectively, òndà, ónyé, ónkyèré and ónkókàsà--the occurring surface forms. With this exception, the tone patterns shown in the right-hand column are themselves those of the surface forms that occur in non-pre-pause position. In pre-pause position, certain other tone patterns are found in some cases because of the effect of the VP-final SUB--cf. Section 4.81 and below.)

P 60 follows most of the other P-rules that change the tones of constituents of Vs. There are, however, certain tone-changing P-rules that follow P 60. One such rule is P 61, the rule that places low tones on VRs in the imperative (cf. Section 4.91, subsection (h)). As a result of this ordering, imperative forms (at least, those that do not immediately precede pause) do not differ in tone according to the presence or absence of SUB. Compare:

Ak-As	<u>Bisà Kòfí.</u>	'Ask Kofi.'
Ak-As	<u>Wó nà bisà Kòfí.</u>	' <u>You</u> ask Kofi.'

(When the imperative V immediately precedes pause, however, there is sometimes a tonal difference between forms that include SUB and those that do not. This difference results from P-rules triggered by the VP-final SUB--cf. Section 4.81--rather than from the operation of P 60. An example is the final high tone on:

Ak-As	<u>Wó nà bisá.</u>	' <u>You</u> ask.'
(cf. Ak-As	<u>Bisà.</u>	'Ask.'))

Another rule that must follow P 60 is P 62, the Asante rule that, after a high tone on SC, assigns a high

tone to NEG and a low tone to a monosyllabic VR, in a negative-perfect formation (cf. Section 4.92, subsection (c)). Thus for the tone pattern of the verb of:

As Ǫnó nà Ǫ́nkòò hó. 'He hasn't gone there.'
(cf. As Ǫ́nkòò hó. 'He hasn't gone there.')

we assume the following derivation:

<u>Before P 60</u>	<u>After P 60</u>	<u>After P 62</u> —
<u>Ǫ́nkòò</u>	<u>Ǫ́nkòò</u>	<u>Ǫ́nkòò</u>

The SUB that is a constituent of V may occur immediately before the SUB that is the final constituent of VP. (This is the case whenever the subordinated V is not followed by an object, an adverb, etc.) Under such circumstances, the surface tone pattern of the verb usually reflects the regular application of P 60 plus the regular application of those P-rules that apply to the VP-final SUB or are contingent on its occurrence. For example, in:

Ak-Fa Kòfí nà Ǫ́réyě. 'It's Kofi who's doing it.'

the surface tone pattern of Ǫ́réyě reflects the following derivation: the underlying tone pattern Ǫ́réyě + V (where V represents VP-final SUB) is, by means of P 39 and P 50, changed to Ǫ́réyě + Ø, and this, in turn is changed to Ǫ́réyě + Ø by P 60. Then Ǫ́réyě + Ø → Ǫ́réyě by P 85, and Ǫ́réyě → Ǫ́réyě by P 86 and P 87.

There are, however, certain cases in which subordinated Vs occurring in VP-final position do not show the expected tone patterns. For example, in Asante the SUB forms of affirmative HABitual, PROgressive, and PERFect verbs formed with monosyllabic VRs show, in VP-final position, a tone pattern in which there is high tone on the SC prefix and (in the PRO and PER forms) the ASpect prefix, and drop tone on the VR. Note the surface tone patterns of the verbs in:

As Kòfí nà $\left\{ \begin{array}{l} \underline{\underline{Ǫ́yě.}} \\ \underline{\underline{Ǫ́réyě}} \text{ [Ǫ́Ǫjě].} \\ \underline{\underline{wááyě.}} \end{array} \right\}$ 'It's Kofi who $\left\{ \begin{array}{l} \text{does} \\ \text{is doing} \\ \text{has done} \end{array} \right\}$ it.'

In non-final position such verbs show the tone patterns that are predicted by P 60: i.e., low-high in the case of the HAB forms, high-high-high in the case of the PRO and PER forms:

As Kòfí nà $\left\{ \begin{array}{l} \text{òyě} \\ \text{òréyě} \\ \text{wááyě} \end{array} \right\} \text{àdwú má.}$ 'It's Kofi who $\left\{ \begin{array}{l} \text{does} \\ \text{is doing} \\ \text{has done} \end{array} \right\}$ work.'

(The tone patterns that occur in the input forms to P 60 are low-high for HAB and low-low-high for PRO and PER: cf. the non-subordinated verbs As òyě 'he does', As òréyě 'he is doing', As wááyě 'he has done'.) Since the underlying verbs end with high tone, and since the rules triggered by VP-final SUB usually leave intact a high tone on the constituent that precedes the SUB, one would expect that the subordinated verbs would show the same surface tone patterns in VP-final position that they show in non-final position.

It may be noted that the irregular VP-final surface tone patterns that occur in Asante in the above cases would be perfectly regular in Akuapem or Fante. (In the latter dialects the non-subordinated verbs end in a high-low, rather than a low-high, tone pattern: e.g., Ak-Fa óyè, òréyè, wááyè. For the derivation of the VP-final form Ak-Fa òréyè from òréyè, see above. The derivation of the subordinated VP-final forms Ak-Fa óyè and wááyè follows similar lines.) Possibly, then, the Asante tone patterns reflect some influence from one of the other dialects. In any case, it seems that a special "adjustment" rule is necessary in order to account for the Asante forms, and we have postulated rule P 63, which simply takes as input the forms that result from the application of the usual rules and converts them to the forms that actually occur.

Another such adjustment rule may be required to account for certain surface tone patterns that occur in Fante. According to data from Stewart (personal communication), the subordinated VP-final forms of certain verbs formed with monosyllabic VRs with underlying low tone (e.g., /dà/ 'sleep') would seem to be irregular. Consider, for example:

- Fa òrèdà (hó). 'He is sleeping (there).'
- Fa Kòfí nà órédà hó. 'It's Kofi who is sleeping there.'
- Fa Kòfí nà órédá. 'It's Kofi who is sleeping.'

For the verb in the last sentence, the usual rules would predict órédà rather than órédá. Since we have not been able to confirm Stewart's data, however, we have not attempted to formulate the adjustment rule that would be necessary to derive the surface forms that he reports.

Appendix

Phonological Rules

The following is a linearly-ordered listing of all the P-rules discussed in the text. The ordering of the rules should be regarded as highly tentative. That is, while in many cases there is clear motivation for the ordering assumed here, in many others the ordering is arbitrary and is subject to revision.

Each of the eighty-seven rules listed is identified by a two-digit Arabic numeral: P 01, P 02, ...P 87. In the case of those rules which were given an interim numbering in Chapter 3 of the text, the Roman numerals used for the interim numbering appear in parentheses after the Arabic numerals. For example, the notation "P 01 (P xxxii)" means that P 01 was given the interim numbering P xxxii in Chapter 3.

All but the last five rules listed (P 83-P 87) are rules of morpheme-level and/or word level phonology. When a "variable" symbol--X, Y, etc.--appears in one of the rules P 01 - P 82, therefore, it is to be understood that the variable does not include a word boundary, and this condition is left unstated in the rule itself.

P 01 (P xxxii) TONE SPREADING

$$\left[\begin{array}{l} \{-Vocalic\} \\ \{+Consonantal\} \\ +Voiced \end{array} \right] \rightarrow [\alpha Tone]/[\alpha Tone]$$

(Note: This rule reapplies immediately whenever the conditions for its application are met.)

P 02 (P v) NASAL PREFIXES

$$[+Vocalic] \rightarrow \langle [\tilde{a}] \rangle \left[\begin{array}{l} -Vocalic \\ +Consonantal \\ \langle +Nasal \rangle \end{array} \right] / + \left[\begin{array}{l} \text{---} \\ +Nasal \\ +G \end{array} \right]$$

P 03 (P ii¹) SYLLABLE-FINAL CONSONANTS

$$[+Consonantal] \rightarrow \left\{ \begin{array}{ll} [+Nasal] & / \left[\begin{array}{l} \text{---} \\ +Voiced \end{array} \right] \\ [+Voiced] & / \left[\begin{array}{l} \text{---} \\ +Anterior \\ -Nasal \end{array} \right] \\ \left[\begin{array}{l} -Consonantal \\ \langle +Glottal \rangle \end{array} \right] & / \left[\begin{array}{l} \text{---} \\ -Coronal \\ \langle -Anterior \rangle \\ -Nasal \end{array} \right] \\ [+Vocalic] & / \left[\begin{array}{l} \text{---} \\ +Coronal \\ -Nasal \end{array} \right] \end{array} \right\} / \text{---} =$$

P 04 (P xi) GLOTTAL-STOP DELETION

$$[+Glottal Constriction] \rightarrow \emptyset / \text{---} X$$

(where X is not a [+PB])

(Note: This rule reapplies immediately whenever the conditions for its application are met.)

P 05 MEDIAL [k] → [g]

$$[-\text{Voiced}] \rightarrow [+ \text{Voiced}] /_{\text{VR}} [X = \begin{bmatrix} \text{---} \\ +\text{Back} \end{bmatrix} \text{v(C)}]$$

P 06 (P i) REGRESSIVE NON-VOWEL NASALIZATION

$$[-\text{Vocalic}] \rightarrow [+ \text{Nasal}] / \left\{ \begin{bmatrix} \text{---} \\ +\text{Consonantal} \\ +\text{Voiced} \end{bmatrix} \right\} / \text{---} \begin{bmatrix} +\text{Vocalic} \\ +\text{Nasal} \end{bmatrix}$$

P 07 (P xix¹) [I] INSERTION

$$\emptyset \rightarrow [I] / \left\{ \begin{array}{l} [g] \\ \begin{bmatrix} +\text{Vocalic} \\ +\text{Back} \\ +\text{High} \end{bmatrix} \\ \left\{ \begin{bmatrix} +\text{Back} \end{bmatrix} \right\} [+ \text{Vocalic}] \\ [k] \end{array} \right\} = \begin{bmatrix} +\text{Vocalic} \\ +\text{Low} \\ +\text{Tense} \end{bmatrix}$$

: As
: Ak-Fa

P 08 (P xiv) MEDIAL [g] DELETION

$$[g] \rightarrow \emptyset / \text{V} \text{---} \text{V(C)} =$$

P 09 (P xv) LABIALIZATION

$$[-\text{Vocalic}] \rightarrow [+ \text{Round}] / = \text{---} [+ \text{Round}]$$

(Note: For a discussion of the application of this rule to certain products of P 31 in some Akuapem subdialects, cf. Section 4.74, subsection (a).)

P 10 (P xvi) [U] DELETION

$$[U] \rightarrow \emptyset / \_\_ [+Vocalic]$$

P 11 (P xvii) PALATALIZATION: 1

$$\begin{bmatrix} -Vocalic \\ +Back \end{bmatrix} \rightarrow [+Palatal] / \left\{ \begin{bmatrix} \_\_ \\ -Nasal \end{bmatrix} \right\} / \begin{bmatrix} \_\_ \\ +Nasal \\ +Round \end{bmatrix} \begin{bmatrix} +Vocalic \\ +Palatal \end{bmatrix} X$$

(where $X \neq (V)(C)=t/s \ X$)

P 12 (P xxi) FRONTED ROUND VOWELS

$$[+Segment] \rightarrow \begin{bmatrix} -Back \\ +Round \end{bmatrix} / \_\_ = [i^{\sim} \theta]$$

P 13 (P xx) [I] DELETION

$$[I] \rightarrow \emptyset / \_\_ [+Vocalic]$$

P 14 (P xiii) FORMATIVE-BOUNDARY DELETION

$$[+FB] \rightarrow \emptyset / [+SC] \_\_ [+ASP]$$
P 15 (P xii¹) [d] → [r]
$$\begin{bmatrix} +Consonantal \\ +Coronal \\ +Voiced \\ -Nasal \end{bmatrix} \rightarrow [+Vocalic] / V \_\_ V$$

P 21 GENERAL RULE OF MONOSYLLABIC REDUPLICATION

$$(a) \text{ RED} \rightarrow C_1 \left[\begin{array}{l} \alpha F \\ +\text{High} \\ \{ \langle \langle +\text{Nasal} \rangle_1 \rangle_2 \} \\ -\text{Nasal} \\ -\text{Tone} \end{array} \right] \langle C_2 \rangle_3 / \text{---} + \text{VR} \left[\begin{array}{l} C_1 \\ \langle +\text{Nasal} \rangle_1 \end{array} \right] \left[\begin{array}{l} \alpha F \\ +\text{High} \\ \langle -\text{Nasal} \rangle_2 \end{array} \right] \\ \left(\left[\begin{array}{l} C_2 \\ \langle +\text{Nasal} \rangle_3 \end{array} \right] \right)$$

(where $C_1 = C_1$, $C_2 = C_2$, and $[\alpha F]$ = all unmentioned features)

$$(b) [-\text{Tone}] \rightarrow [+ \text{Tone}] / +\text{RED} + \text{VR} [C \text{---} (C)]$$

P 22 [I] $\rightarrow$ [U] IN MONOSYLLABIC REDUPLICATION

$$[-\text{Back}] \rightarrow [+ \text{Back}] / C \left[\begin{array}{l} \text{---} \\ +\text{RED} \end{array} \right] (C) + \text{VR} \left[\left\{ \begin{array}{l} [+ \text{Round} \\ -\text{Palatal} \\ +\text{Coronal} \end{array} \right\} \right\} [+ \text{Low}] (C) \left[\begin{array}{l} -\text{Round} \\ -\text{Coronal} \end{array} \right]$$

(Note: For dialectal restrictions, cf. Section 4.62, subsection (a).)

P 23 GENERAL RULE OF DISYLLABIC REDUPLICATION

$$\text{RED} \rightarrow =X_1=C_1V_1\langle C_2 \rangle / \text{---} + X_1=C_1V_1 \left(\left[\begin{array}{l} C_2 \\ \langle -\text{Nasal} \rangle \end{array} \right] \right) =$$

(where $X_1=X_1$, $C_1=C_1$, $V_1=V_1$, $C_2=C_2$)

P 24 NASAL DELETION IN DISYLLABIC REDUPLICATION

- (a) $\begin{bmatrix} -\text{Vocalic} \\ +\text{Nasal} \\ +\text{RED} \end{bmatrix} \rightarrow \emptyset / (V \_\_ +_{VR} [X = X])$
- (b) $\begin{bmatrix} \alpha\text{Nasal} \\ +\text{RED} \end{bmatrix} \begin{bmatrix} -\text{Vocalic} \\ +\text{Nasal} \\ +\text{RED} \end{bmatrix} \rightarrow \begin{bmatrix} +\text{Nasal} \\ +\text{RED} \end{bmatrix} \emptyset / \_\_ +_{RED} [\text{CVC}]$

(optional)

(Note: For dialectal restrictions, cf. Section 4.64, subsection (a).)

P 25 (P vi) HOMORGANIC NASAL

$$\begin{bmatrix} +\text{Consonantal} \\ +\text{Nasal} \end{bmatrix} \rightarrow \begin{bmatrix} \alpha\text{Coronal} \\ \beta\text{Back} \\ \gamma\text{High} \end{bmatrix} / \_\_ (+) \begin{bmatrix} -\text{Vocalic} \\ \alpha\text{Coronal} \\ \beta\text{Back} \\ \gamma\text{High} \end{bmatrix}$$

(Note: For dialectal restrictions in verbs involving disyllabic reduplication, cf. Section 4.64, subsection (b).)

P 26 NASAL DELETION IN MONOSYLLABIC REDUPLICATION

$$\begin{bmatrix} -\text{Vocalic} \\ +\text{Nasal} \\ +\text{RED} \end{bmatrix} \rightarrow \emptyset / \_\_ +_{VR} \begin{bmatrix} -\text{Vocalic} \\ +\text{Nasal} \end{bmatrix} V(C) : Ak$$

P 27 VOWEL GEMINATION IN DISYLLABIC REDUPLICATION

$$(a) \begin{bmatrix} +Vocalic \\ \alpha F \\ \beta Nasal \\ \gamma Tone \\ +RED \end{bmatrix} = \left\{ \begin{bmatrix} [I] \\ -Vocalic \\ <+Nasal> \\ \delta Tone \\ +RED \end{bmatrix} \right\} + \rightarrow \begin{bmatrix} +Vocalic \\ \alpha F \\ <+Nasal> \\ \beta Nasal \\ \gamma Tone \\ +RED \end{bmatrix} = \begin{bmatrix} +Vocalic \\ \alpha F \\ <+Nasal> \\ \beta Nasal \\ \delta Tone \\ +RED \end{bmatrix} + :Fa \text{ (optional)}$$

(where $[\alpha F]$ = all unmentioned features)

$$(b) [+Low] \rightarrow [-Low]/[+RED] +_{VR} [C\_ = I]$$

(where part (a) of rule has applied)

P 28 VOWEL GEMINATION IN RE-DUPLICATED MONOSYLLABIC VERBS

$$(a) (a) \begin{bmatrix} -Vocalic \\ +RED \end{bmatrix} \rightarrow \emptyset/[+RED] + \begin{bmatrix} +Vocalic \\ +RED \end{bmatrix} (C) +_{VR} [CV(C)] : Fa \text{ (optional)}$$

$$(b) \begin{bmatrix} +Vocalic \\ \alpha Nasal \\ +RED \end{bmatrix} \begin{bmatrix} -Vocalic \\ +Nasal \\ +RED \end{bmatrix} \rightarrow \begin{bmatrix} +Vocalic \\ +Nasal \\ +RED \end{bmatrix} \emptyset / \_ + \begin{bmatrix} +Vocalic \\ +RED \end{bmatrix} \_$$

$$(c) [+Low] \rightarrow [-Low] / \begin{bmatrix} \_ \\ +Vocalic \\ +RED \end{bmatrix} + \begin{bmatrix} I \\ +RED \end{bmatrix}$$

$$(d) [\alpha F] \rightarrow [\beta F] / \begin{bmatrix} \_ \\ +Vocalic \\ +RED \end{bmatrix} / \begin{bmatrix} +Vocalic \\ \beta F \\ +RED \end{bmatrix} + \_$$

(where $[\alpha F]$ and $[\beta F]$ = all unmentioned features)

P 29 (P x) FINAL [w] $\rightarrow$ [?]

$$[w] \rightarrow [?]/\_ + :As, Fa^2$$

P 30 FINAL [r,m,n] → [ʔ]

$$\begin{Bmatrix} [r] \\ [m] \\ [n] \end{Bmatrix} \rightarrow [ʔ] / \begin{Bmatrix} \text{---} \\ +VR \\ +P 30 \end{Bmatrix} +$$

(Note: For dialect-specific conditions on this rule, cf. Section 4.72)

P 31 VOWEL ADDITION TO NON-VOWEL-FINAL VERB ROOT

$$\emptyset \rightarrow \begin{Bmatrix} +Vocalic \\ +High \\ \{ \langle \langle +Back \rangle_1 \rangle_2 \} \\ -Back \\ \{ \langle +Tense \rangle_3 \} \\ -Tense \\ \{ \langle +Nasal \rangle_4 \} \\ -Nasal \\ -Tone \end{Bmatrix} / \begin{Bmatrix} +Vocalic \\ \langle +High \rangle \\ \langle +Back \rangle_1 \\ \langle +Tense \rangle \\ \langle -Low \rangle_3 \\ +VR \end{Bmatrix} \begin{Bmatrix} \{ -Vocalic \\ +Consonantal \} \\ \langle -Coronal \rangle \\ \langle +Anterior \rangle_2 \\ \langle +Nasal \rangle_4 \\ +VR \end{Bmatrix} +$$

P 32 RESYLLABIFICATION

$$CVC=V\#\# \rightarrow CV=CV\#\#$$

(Note: This rule reapplies immediately whenever the conditions for its application are met.)

P 33 FINAL VOWEL → [ʔ]

$$\begin{Bmatrix} +Vocalic \\ +High \end{Bmatrix} \rightarrow \emptyset / \left\{ \begin{array}{l} VR[X] + \_\_\# \\ VR[X=[+Voiced] \_\_] \end{array} \right\}$$

(where: (a) affected segment ≠ [+PAS]
(b) various dialect-specific conditions are met (cf. Section 4.79)

P 34 PAST VOWEL ADDITION

$$\emptyset \rightarrow \begin{bmatrix} +\text{Segment} \\ \alpha F \\ -\text{Tone} \end{bmatrix} /_{VR} \begin{bmatrix} +\text{Segment} \\ \alpha F \\ \beta \text{Tone} \end{bmatrix} ([?]) \_\_ [+PAS]$$

(where F = all segmental features, and $\alpha = +$ for [Vocalic], - for [Consonantal])

P 35 PAST CONTRACTION: 1

$$[+\text{Segment}] \rightarrow \emptyset /_{VR} [X[+\text{Tone}]X[-\text{Tone}]X] \_\_ [+PAS] : Fa$$

P 36 PAST SUFFIX DELETION AND CONSONANT LENGTHENING

$$(a) \quad [+PAS] \rightarrow \emptyset / \_\_ X$$

(where $X \neq [+PB]$)

$$(b) \quad \emptyset \rightarrow \begin{bmatrix} +\text{Segment} \\ -\text{Vocalic} \\ \alpha F \end{bmatrix} /_{VR} [X \begin{bmatrix} -\text{Vocalic} \\ \alpha F \end{bmatrix}] \_\_ : As$$

(where the input to (b) has undergone (a))

P 37 ASSIMILATION OF VOWELS TO PAST SUFFIX

$$[+\text{Back}] \rightarrow [-\text{Back}] / \left\{ \begin{array}{l} VR[X[-\text{Vocalic}]] \_\_ + [+PAS] \\ VR[X \begin{bmatrix} \_\_ \\ +\text{Vocalic} \end{bmatrix} (?)] \_\_ + [+PAS] \end{array} \right\} : Fa$$

P 38 PAST CONTRACTION: 2

$$[+\text{Segment}] \rightarrow \emptyset /_{VR} [X[+\text{Vocalic}]([?])] \left\{ \begin{array}{l} \_\_ [+PAS] \\ [+Vocalic] \begin{bmatrix} \_\_ \\ +PAS \end{bmatrix} \end{array} \right\} : \begin{array}{l} Ak \\ Fa \end{array}$$

P 39 SUBORDINATIVE AND NOMINAL-SUFFIX DELETION

$$[\alpha F] \rightarrow \emptyset / \left[\begin{array}{c} \text{---} \\ +\text{Segment} \\ +\text{Tone} \\ \{ +\text{SUB} \} \\ \{ +\text{NS} \} \end{array} \right]$$

(where SUB is the last IC of VP; optional or inapplicable in Asante in certain cases--cf. Section 4.81, subsection (a))

P 40 VOWEL HARMONY IN SUBORDINATIVE AND NOMINAL SUFFIX

$$(a) \left[\begin{array}{c} \{ +\text{SUB} \} \\ \{ +\text{NS} \} \end{array} \right] \rightarrow \left[\begin{array}{c} \alpha \text{Back} \\ \beta \text{Tense} \\ \gamma \text{Nasal} \end{array} \right] / \left[\begin{array}{c} \alpha \text{Back} \\ \beta \text{Tense} \\ \gamma \text{Nasal} \end{array} \right] + \text{---} : \text{As}$$

$$(b) [-\text{High}] \rightarrow [+ \text{High}] / \left[\begin{array}{c} \text{---} \\ +\text{Nasal} \\ \{ +\text{SUB} \} \\ \{ +\text{NS} \} \end{array} \right] : \text{As}$$

(where SUB is the last IC of VP)

P 41 TONE RAISING BEFORE SUBORDINATIVE AND NOMINAL SUFFIX

$$[-\text{Tone}] \rightarrow [+ \text{Tone}] / \text{---} + \left[\begin{array}{c} \alpha F \\ \{ +\text{SUB} \} \\ \{ +\text{NS} \} \end{array} \right] : \text{As}$$

(where $[\alpha F]$ indicates that segmental features are present; for restrictions on application of this rule to segments preceding SUB, cf. Section 4.81, subsection (c))

P 42 SUBJECT-CONCORD ASSIMILATION IN PERFECT AND CONSECUTIVE

$$(a) [ɔ] \rightarrow [wɔ] / + \left[\begin{array}{c} \text{---} \\ +\text{SC} \end{array} \right] [a]$$

$$(b) [+ \text{Vocalic}] \rightarrow \emptyset / + \left[\begin{array}{c} \text{---} \\ +\text{SC} \end{array} \right] [a]$$

$$(c) \{ +\text{Vocalic} \} \rightarrow [a] / \left[\begin{array}{c} \text{---} \\ +\text{SC} \end{array} \right] [a]$$

P 43 STATIVE/CONSECUTIVE LOW TONE

$$[+Vocalic] \rightarrow [-Tone] / \left\{ \begin{array}{l} [+STA]([+NEG])_{VR}[X\_X] \\ [+CON]_{VR}[C\_ (C)] \end{array} \right\}$$

P 44 NEGATIVE-STATIVE HIGH TONE

$$[+Segment] \rightarrow [+Tone] / [+STA] + \left[\begin{array}{c} \langle \longrightarrow \rangle \\ +NEG \end{array} \right] + C\_ : \langle Fa \rangle$$

P 45 PAST LOW TONE

$$[+Vocalic] \rightarrow [+Low] / X_{VR}[C\_ (C)]\_ + [+PAS] : As$$

(where $X \neq X + [+NEG] + X$)

P 46 PAST TONE CHANGES

$$(a) [-Tone] \rightarrow [+Tone] /_{VR}[C\_ (C)] + [+PAS] : Fa$$

$$(b)_{VR}[X[-Tone]X[+Tone]X] \rightarrow_{VR}[X[+Tone]X[-Tone]X] / \_ + [+PAS] : Fa$$

$$(c)_{VR}[X[+Tone]X[-Tone]X] \rightarrow_{VR}[X[-Tone]X[+Tone]X] / \_ + [+PAS] : Fa$$

(where (b) and (c) are disjunctively ordered)

P 47 INGRESSIVE LOW TONE

$$\left[\begin{array}{l} +Vocalic \\ +ING \end{array} \right] \rightarrow [-Tone] : Ak-As$$

P 48 HIGH TONE AFTER PERFECT

$$[+Vocalic] \rightarrow [+Tone]/[+SC][+PER]+\left\{\begin{array}{c} VR \\ ING \end{array}\right\}[C\_X]$$

P 49 OPTATIVE TONE

$$(a) [+Vocalic] \rightarrow [+Tone]/[+OPT](_{ING}[X\_])_{VR}[X\_X]$$

$$(b) [+Vocalic] \rightarrow [-Tone]/[+OPT]([+ING])_{VR}[X = C\_X] : Fa$$

P 50 MONOSYLLABIC VR TONE REVERSAL

$$\left[\begin{array}{c} -Tone \\ \left\{\begin{array}{c} +SC \\ +ASP \end{array}\right\} \end{array}\right] +_{VR}[C[+Tone](C)] \rightarrow \left[\begin{array}{c} +Tone \\ \left\{\begin{array}{c} +SC \\ +ASP \end{array}\right\} \end{array}\right] +_{VR}[C[-Tone](C)]/\_\_\#\# : Ak-Fa$$

P 51 HIGH TONE ON PERFECT

$$[+PER] \rightarrow [+Tone]/\_\_\_+C[+Tone] : Fa$$

P 52 HIGH-TONE SECOND-PERSON SUBJECT CONCORD

$$[-Tone] \rightarrow [+Tone]/\left[\begin{array}{c} \_\_\_ \\ +SC \\ +2nd\ Person \end{array}\right]$$

$$(where \left[\begin{array}{c} \_\_\_ \\ +SC \\ +2nd\ Person \end{array}\right] \neq Fa [w\dot{3}])$$

P 53 HIGH TONE ON PROGRESSIVE BEFORE NEGATIVE

$$[-\text{Tone}] \rightarrow [+ \text{Tone}] / \left[\begin{array}{c} \text{---} \\ +\text{PRO} \end{array} \right] + [+ \text{NEG}]$$

P 54 NEGATIVE HIGH TONE BEFORE PAST

$$[\alpha \text{Tone}] \rightarrow [+ \text{Tone}] / \left[\begin{array}{c} \text{---} \\ +\text{NEG} \end{array} \right] + \text{C} \left[\begin{array}{c} \text{---} \\ +\text{Vocalic} \end{array} \right] / \text{---} \text{X} [+ \text{PAS}] : \text{Fa}$$

P 55 HIGH TONE SUBJECT CONCORD BEFORE HIGH-TONE NEGATIVE, PROGRESSIVE, OR OPTATIVE

$$[-\text{Tone}] \rightarrow [+ \text{Tone}] / \left[\begin{array}{c} \text{---} \\ +\text{SC} \end{array} \right] \left\{ \begin{array}{l} \left[\begin{array}{c} +\text{Tone} \\ +\text{NEG} \\ +\text{OPT} \end{array} \right] \\ \left[\begin{array}{c} +\text{Tone} \\ +\text{PRO} \end{array} \right] [+ \text{NEG}] \end{array} \right\}$$

P 56 PROGRESSIVE-ASPECT FORM

$$(a) [r][\alpha F] \rightarrow \emptyset / \left[\begin{array}{c} \text{---} \\ +\text{Segment} \\ \beta \text{Tone} \\ +\text{PRO} \end{array} \right] : \text{As (obligatory), Ak-Fa (optional)}$$

(where $[\alpha F]$ = all unmentioned feature specifications of the vowel of PRO)

$$(b) \left[\begin{array}{c} +\text{Vocalic} \\ +\text{Low} \end{array} \right] \rightarrow [-\text{Low}] / \text{---} + \left[\begin{array}{c} +\text{Segment} \\ \emptyset F \\ +\text{PRO} \end{array} \right] \text{X}$$

(where $\text{X} \neq +[+ \text{NEG}] \text{X}$)

$$(c) [\emptyset F] \rightarrow [\alpha F] / [\alpha F] + \left[\begin{array}{c} \text{---} \\ +\text{Segment} \\ \beta \text{Tone} \\ +\text{PRO} \end{array} \right] \text{X}$$

(where $\alpha = +$ for [Vocalic] and $-$ for [Consonantal], and where $\text{X} \neq +[+ \text{NEG}] \text{X}$)

P 57 PREFIX HIGH-TONE AGREEMENT

$$\emptyset \rightarrow \left[\begin{array}{c} +\text{Segment} \\ +\text{Tone} \end{array} \right] / [+ \text{Tone}] (C) (+) \left\{ \begin{array}{l} \left\{ \begin{array}{c} [+PER] \\ [+CON] \\ [+NEG] +_{VR} [X=X] + [+PAS] \end{array} \right\} \\ [+STA] + \_ + [+NEG] \end{array} \right\} \left. \begin{array}{l} : \text{Ak-As} \\ : \text{Ak-As} \\ : \text{Ak-As} \\ : \text{As} \end{array} \right\}$$

(Note: In Asante, this rule follows P 58)

P 58 HIGH TONE AFTER NEGATIVE BEFORE PAST

$$[+Vocalic] \rightarrow [+Tone] / \left[\begin{array}{c} -\text{Tone} \\ +\text{NEG} \end{array} \right] +_{VR} [X \_ X=X] + [+PAS] : \text{Ak-As}$$

P 59 TONE LOWERING IN DISYLLABIC REDUPLICATION

$$(a) [+Tone] \rightarrow [-Tone] / \text{RED} [X=X] + X \_ X$$

$$(b) [+Tone] \rightarrow [-Tone] / \text{RED} [X=X \left[\begin{array}{c} \_ \\ +\text{Consonantal} \\ +\text{Nasal} \end{array} \right]] : \text{Fa}$$

P 60 VERB-FINAL SUBORDINATIVE TONE CHANGES

$$(a) [-Tone] \rightarrow [+Tone] / \left\{ \begin{array}{l} \left[\begin{array}{c} \_ \\ +SC \\ +ASP \\ +ING \end{array} \right] \\ VR [C \_ (C)] / \left\{ \begin{array}{c} [+STA] \\ [+NEG] + \_ \\ \_ + [+PAS] \end{array} \right\} \\ VR [C \_ X=X] / \left[\begin{array}{c} -\text{NEG} \\ -\text{FUT} \\ -\text{ING} \end{array} \right] + \_ \end{array} \right\} / \_ X +_V [+SUB]$$

(Note: In Asante applies to $\left[\begin{array}{c} \_ \\ +SC \end{array} \right]$ only if following formative is PRO, PER, CON, or NEG)

P 60 Continuation of VERB-FINAL SUBORDINATIVE TONE CHANGES

$$(b) \emptyset \rightarrow \begin{bmatrix} +\text{Segment} \\ +\text{Tone} \end{bmatrix} / \_\_\_ [+NEG]X \text{ }_V [+SUB]$$

P 61 IMPERATIVE LOW TONE

$$[+Vocalic] \rightarrow [-\text{Tone}] / \left\{ \begin{array}{l} [+STA]([+NEG]) \\ [+IMP] \end{array} \right\} \text{ }_{VR} [X \_\_\_ X]Y$$

(If environment is $[+STA]([+NEG]) \text{ }_{VR} [X-X]Y$, Y does not include $\text{ }_V [+SUB]$)

P 62 HIGH NEGATIVE, LOW VERB ROOT BEFORE PAST

$$\left(\begin{bmatrix} +\text{Segment} \\ +\text{Tone} \end{bmatrix} \right) \begin{bmatrix} -\text{Tone} \\ +NEG \end{bmatrix} + \text{ }_{VR} [C[+\text{Tone}](C)] \rightarrow \begin{bmatrix} +\text{Tone} \\ +NEG \end{bmatrix} + \text{ }_{VR} [C[-\text{Tone}](C)] /$$

$$[+\text{Tone}](C) + \_\_\_ + [+PAS] : \text{As}$$

P 63 SUBORDINATIVE TONE ADJUSTMENT

$$\langle \begin{bmatrix} \alpha\text{Tone} \\ +SC \end{bmatrix} \rangle \left\{ \begin{array}{l} +HAB \\ +PER \\ +PRO \end{array} \right\} \text{ }_{VR} [C[\beta\text{Tone}](C)] \rightarrow$$

$$\langle \begin{bmatrix} +\text{Tone} \\ +SC \end{bmatrix} \rangle \left\{ \begin{array}{l} +HAB \\ +PER \\ +PRO \end{array} \right\} \text{ }_{VR} [C[-\text{Tone}](C)] / \_\_\_ + [+SUB][+SUB] : \text{As}$$

P 64 LOW-TONE SUBJECT CONCORD DELETION

$$\begin{bmatrix} -\text{Tone} \\ \emptyset_F \\ +SC \end{bmatrix} \rightarrow \emptyset : \text{Ak-As}$$

P 65 TONE RAISING IN DISYLLABIC REDUPLICATION

$$(a) \emptyset \rightarrow \begin{bmatrix} +\text{Segment} \\ +\text{Tone} \end{bmatrix} / W_{\text{RED}} [X=X] \text{CV}(C) \_\_\_\_\_\_ X[+PB] : \text{As}$$

(where $W \neq X+\text{RED}$)

$$(b) [-\text{Tone}] \rightarrow [+Tone] / \begin{bmatrix} +\text{Segment} \\ +\text{Tone} \\ \emptyset F \end{bmatrix} X \_\_\_\_\_\_ X[+PB] : \text{As}$$

(where $\begin{bmatrix} +\text{Segment} \\ +\text{Tone} \\ \emptyset F \end{bmatrix}$ has been introduced by part (a) of the rule)

P 66 CONSECUTIVE/IMPERATIVE HIGH TONE BEFORE PHRASE BOUNDARY

$$[+\text{Vocalic}] \rightarrow [+Tone] / \left\{ \begin{bmatrix} +\text{CON} \\ +\text{IMP} \end{bmatrix} \right\}_{\text{VR}} [C \_\_\_\_\_\_ (C)][+PB]$$

P 67 HIGH TONE AFTER INGRESSIVE DISYLLABIC VR BEFORE PHRASE BOUNDARY

$$\emptyset \rightarrow \begin{bmatrix} +\text{Segment} \\ +\text{Tone} \end{bmatrix} / [+ING]_{\text{VR}} [X=X] \_\_\_\_\_\_ [+PB] : \text{Ak-As}$$

P 68 HIGH TONE ON VERB-FINAL NON-VOWEL BEFORE PHRASE BOUNDARY

$$[-\text{Tone}] \rightarrow [+Tone] / {}_V [X \begin{bmatrix} +\text{Vocalic} \\ +\text{Tone} \end{bmatrix}] = \left[\begin{bmatrix} -\text{Vocalic} \\ +\text{Consonantal} \end{bmatrix} \right] ([?])([+PB])$$

P 69 (P xxii) VOWEL TENSING (WITHIN WORD BOUNDARIES)

$$\begin{bmatrix} +\text{Vocalic} \\ +G \end{bmatrix} \rightarrow [+Tense] / \_\_\_\_\_\_ X \begin{bmatrix} +\text{Vocalic} \\ -\text{Low} \\ +\text{Tense} \\ -G \end{bmatrix} Y \_\_\_\_\_\_$$

(where: (a) if the affected segment precedes X, X does not include a $[+\text{Vocalic}, -G]$ segment; (b) if the affected segment follows Y, Y does not include a $[+\text{Vocalic}, -G]$ segment)

P 70 (P iii) $[\eta] \rightarrow [n]$

$$[\eta] \rightarrow [n]/V\_ \begin{cases} (+)V \\ (?)## \end{cases} \begin{matrix} : \text{As-Fa} \\ : \text{Fa} \end{matrix}$$

P 71 (P iv) $[\eta(?)]$ VOCALIZATION

$$(a) [\eta] \rightarrow \emptyset/[\eta]\_## : \text{As}$$

$$(b) [\eta] \rightarrow \begin{bmatrix} +\text{Vocalic} \\ \alpha\text{Back} \\ \beta\text{Tense} \end{bmatrix} / \begin{bmatrix} +\text{Vocalic} \\ \alpha\text{Back} \\ \beta\text{Tense} \end{bmatrix} \_## : \text{As}$$

P 72 (P vii) PROGRESSIVE NON-VOWEL NASALIZATION

$$\begin{bmatrix} -\text{Vocalic} \\ +\text{Voiced} \end{bmatrix} \rightarrow [+Nasal] / \begin{bmatrix} -\text{Vocalic} \\ +Nasal \end{bmatrix} (+)\_ : -\text{Fa}^n$$

P 73 (P viii) NASALIZED VOWEL SEQUENCES

$$[+\text{Vocalic}] \rightarrow [+Nasal] / (+) \begin{bmatrix} +\text{Vocalic} \\ +Nasal \end{bmatrix} (+)$$

P 74 (P ix) REGRESSIVE VOWEL NASALIZATION

$$\begin{bmatrix} +\text{Vocalic} \\ +\text{High} \end{bmatrix} \rightarrow [+Nasal] / \_ \begin{bmatrix} +\text{Consonantal} \\ +Nasal \end{bmatrix} =$$

P 75 (P xviii) PALATALIZATION: 2

$$\begin{bmatrix} -\text{Vocalic} \\ +\text{Consonantal} \\ -G \end{bmatrix} \rightarrow [+Palatal] / \_ \begin{bmatrix} +\text{Vocalic} \\ +\text{Palatal} \end{bmatrix} : \text{Fa}$$

P 76 (P xxv) PROGRESSIVE VOWEL BACKING

$$\begin{bmatrix} +\text{Vocalic} \\ -\text{Back} \\ -\text{Low} \end{bmatrix} \rightarrow [+Back] / \begin{bmatrix} -\text{Vocalic} \\ +\text{Round} \end{bmatrix} \_\_\_ [-\text{Vocalic}] =$$

P 77 (P xxvi) REGRESSIVE VOWEL BACKING

$$\begin{bmatrix} +\text{Vocalic} \\ -\text{Back} \\ -\text{Low} \end{bmatrix} \rightarrow [+Back] / \_\_\_ [+Round] + : \text{Fa}$$

P 78 (P xxvii) BACKNESS HARMONY

$$\begin{bmatrix} +\text{Vocalic} \\ \alpha\text{Back} \\ -\text{Low} \\ +\text{G} \end{bmatrix} \rightarrow [-\alpha\text{Back}] / \_\_\_ \text{X} \begin{bmatrix} +\text{Vocalic} \\ -\alpha\text{Back} \\ -\text{G} \end{bmatrix} : \text{Fa}$$

(where X does not include a [+Vocalic, -G] segment)

P 79 HIGH-TONE ADDITION IN ENVIRONMENT HIGH-LOW ___ HIGH

$$\emptyset \rightarrow \begin{bmatrix} +\text{Segment} \\ +\text{Tone} \end{bmatrix} \rightarrow / [+Tone] = \text{C} [-Tone] = \_\_\_ \left(\begin{bmatrix} -\text{Vocalic} \\ +\text{Consonantal} \\ +\text{Voiced} \end{bmatrix} \right) [+Tone]$$

P 80 (P xxviii) VOWEL DELETION BEFORE [r]

$$\begin{bmatrix} +\text{Vocalic} \\ +\text{High} \end{bmatrix} \rightarrow \emptyset / \text{C} \_\_\_ = \text{r}$$

P 81 FUTURE: mebe $\rightarrow$ me

$$[+\text{Segment}] \rightarrow \emptyset / \begin{bmatrix} \_\_\_ \\ +\text{Vocalic} \\ +\text{SC} \\ +\text{1st Person} \\ +\text{Singular} \end{bmatrix} \begin{bmatrix} \_\_\_ \\ +\text{Consonantal} \\ +\text{FUT} \end{bmatrix} : \text{Ak-As}$$

P 82 GLOTTAL-STOP ADDITION

$$\emptyset \rightarrow [?] / \left[\begin{array}{l} +\text{Vocalic} \\ +\text{VR} \\ +\text{P 82} \end{array} \right] \text{---} + : \text{Ak}$$

P 83 (Pxxiii) VOWEL TENSING ACROSS WORD BOUNDARIES

$$\left[\begin{array}{l} +\text{Vocalic} \\ -\text{Tense} \end{array} \right] \rightarrow [+Tense] / \text{---} \# \# \text{C} \left[\begin{array}{l} +\text{Vocalic} \\ -\text{Low} \\ +\text{Tense} \\ -\text{G} \end{array} \right]$$

P 84 (P xxiv) [ə] → [æ]/[e]

$$\left[\begin{array}{l} +\text{Vocalic} \\ +\text{Low} \\ +\text{Tense} \end{array} \right] \rightarrow \left\{ \begin{array}{l} [+Coronal] \\ [-Low] \end{array} \right\} / \text{---} (\text{C}) = \text{C} \left[\begin{array}{l} +\text{Vocalic} \\ +\text{Tense} \end{array} \right] : \text{Ak-As} \\ : \text{Fa}$$

P 85 (P xxx) TONE INCORPORATION

$$\begin{aligned} \text{(a)} \quad & \left[\begin{array}{l} +\text{Segment} \\ \alpha\text{Tone} \\ \emptyset\text{F} \end{array} \right] \rightarrow =(\text{C}) \rightarrow =(\text{C}) \left[\begin{array}{l} +\text{Segment} \\ \alpha\text{Tone} \\ \emptyset\text{F} \end{array} \right] \\ \text{(b)} \quad & (\text{C}) = \left[\begin{array}{l} +\text{Segment} \\ \alpha\text{Tone} \\ \emptyset\text{F} \end{array} \right] \rightarrow \left[\begin{array}{l} +\text{Segment} \\ \alpha\text{Tone} \\ \emptyset\text{F} \end{array} \right] (\text{C}) = \bullet \end{aligned}$$

(where $\emptyset\text{F}$ indicates that no segmental features are present)

P 86 (P xxix) DOWNDRIFT

$$\begin{aligned} \text{(a)} \quad & [\alpha\text{Tone}]^* \rightarrow [+Pitch \text{ n}] / [+PB] \text{X} \text{---} \text{Y} \\ \text{(b)} \quad & [+Tone]^* \rightarrow [+Pitch \text{ n+z}] / \left[\begin{array}{l} -\text{Tone} \\ +\text{Pitch n} \end{array} \right] \text{X} \text{---} \text{Y} \\ \text{(c)} \quad & [-Tone]^* \rightarrow [+Pitch \text{ n-3}] / \left[\begin{array}{l} +\text{Tone} \\ +\text{Pitch n} \end{array} \right] \text{X} \text{---} \text{Y} \end{aligned}$$

(where X and Y do not include tone-bearing segments other than those affected by the rule, and where X does not include a [+PB])

P 87 (P xxxi) TONE SIMPLIFICATION

$$\left\{ \begin{array}{l} \left[\begin{array}{l} \alpha \text{Tone} \\ \beta \text{F} \end{array} \right] \left[\begin{array}{l} \gamma \text{Tone} \\ \emptyset \text{F} \end{array} \right] \\ \left[\begin{array}{l} \alpha \text{Tone} \\ \emptyset \text{F} \end{array} \right] \left[\begin{array}{l} \gamma \text{Tone} \\ \beta \text{F} \end{array} \right] \end{array} \right\} \rightarrow \left\{ \begin{array}{l} \left[\begin{array}{l} + \text{Tone} \\ \beta \text{F} \end{array} \right] \quad (\text{where } \alpha \text{ or } \gamma = +) \\ \left[\begin{array}{l} - \text{Tone} \\ \beta \text{F} \end{array} \right] \quad (\text{where } \alpha \text{ and } \gamma = -) \end{array} \right\}$$

(where $[\beta \text{F}]$ indicates that segmental features are present
and $[\emptyset \text{F}]$ indicates that no segmental features are present)

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